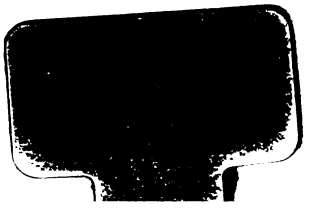
THE STATE OF THE NAVY 1878.

BY HENRY F. WATT.

SECOND EDITION.



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STATE OF THE NAVY,

1878.

UNARMOURED SHIPS.

BY

HENRY F. WATT,

MASTER MARINER.

SECOND EDITION.

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PREFACE.

Most thoughtful men with whom I am acquainted are of opinion that the Navy is not what it ought to be, and that a great deal of the money spent upon it is wasted. It may not be difficult to show this, but to show how to do it better is not so simple a task. A number of patriotic men, such as Seeley, Shaw Lefevre, A. Egerton, and Thomas Brassey, have done great good, but there is still much room for improvement. My clear opinion is that it is within the truth to say, one-half of the money spent on building is wasted; and two-thirds of that spent in repairs is also wasted, for the simple reason that had the ships been properly built the repairs would not have been wanted.

The practical men who could with most advantage find fault with the building are our best shipbuilders, but as these men work for the government, it would be ruinous to their interests to criticise their employers. As regards the training of young seamen, the suggestions of Captain Wilson, R.N., are not half carried out; and as to that of the young officers, although the disaster to the *Vanguard* has opened the eyes of the Admiralty to the fact that pic-nicing about the coast in ironclads is not the way to it, a proper training squadron is as far off as ever.

In the following pages I have approached the question from a seaman's point of view. I have no grievances to air,

am not in the service, and in any communications with naval men have always received the greatest courtesy and attention. Whatever may be the value of my deductions, the information here got together, which, so far as I know, is not elsewhere attainable, may, I hope, be of use in the hands of others of more influence and opportunities than I possess, in bringing about a better state of things.

The man who can travel for twenty-four years from Dan to Beersheba, without seeing in the Queen, the institutions, and the government of his country, how much he has to be thankful for, is indeed to be pitied; and if these pages do any good to our Navy, I shall consider I have attempted to repay an instalment of that debt which every man owes to his profession, and the purpose will be served for which they were written.

I have to express my obligations to the *Times* newspaper, and to Palmer's Index, to the British Museum and Brown Library Reading Rooms, and to many shipowners, shipbuilders, and to my brother shipmasters, who have given me information, shown me their works, etc., and whose patience for some years I must have severely taxed. I hope no private shipowners will take offence at my having assessed the value of their ships; for it is useless to point out that the Navy vessels cost twice as much as they ought to do, without at the same time endeavouring to show what the cost of a first-class mail steamer is.

WAVERTREE, LIVERPOOL,

April, 1878.

PREFACE TO THE SECOND EDITION.

THIS edition contains some further remarks on the *Iris*, and on the Naval College. The loss of the *Eurydice*, and the measures taken by Mr. Smith to protect our commerce against privateers, such as the *Cimbria*, are also noticed.

Table III. has been brought up to date, and the *Hecla* added to Table V.

WAVERTREE, LIVERPOOL,
September 1*st*, 1878.

THE STATE OF THE NAVY.

CHAPTER I.

THIS work is occupied with our unarmoured vessels of 1,000 tons, B.M., and upwards. The line is drawn at 1,000 tons, as a smaller vessel would be of no use to protect our commerce. Ironclads and smaller vessels are not for the present mentioned, except in the briefest way, and for the reason that I consider we have plenty of ironclads, and that no combination of the six naval powers is at all probable that would give them even a numerical superiority. Besides, with our present knowledge of explosives, it appears to me in the last degree questionable, putting five hundred lives, half a million of money, and four years' labour into one basket.

Our thirty-nine vessels, with seven building, is but a beggarly show of empty benches, when we consider we spend about eleven millions yearly on our Navy, the more so when we reflect that these costly vessels, whose useful life does not exceed twelve years, are only suited to protect our sailing ships. The reason we have so few is, that the money is very ill spent. £85 a-ton is a long price for a high-speed mail steamer; the composite "gem" class cost over £70 a-ton, the frigates £90 a-ton, and upwards; and even the wooden-built "gem" corvettes cost over £60 a-ton. The cost of repairing our wooden vessels is perfectly frightful. The following items, taken from the Blue Book, dockyard accounts, vol. 44, of 1873, will give some idea of it.

Money expended in ordinary repairs in financial year 1870–71 :—*Doris* frigate, £23,650; *Immortalité* ditto,

£21,818; *Narcissus* ditto, £30,172, for repairing and completing for sea; *Topaze* ditto, £25,786; *Scout* corvette, £18,642.

All these sums are excharges, that is, establishment and general charges are not included in these items. These may be put down at 38 per cent. additional. (See Table IV.)

In this work the following definitions and propositions are taken as axiomatic.

A ship must be able to go to sea and keep the sea in all weathers. She must be able to steam head to wind and sea in moderately rough weather. In the table of merchant ships, I have inserted, so far as I know, no vessel that has failed in the matter of structural strength, or has had to be strengthened immediately after she was built.

The speed of a steamship is what she would average on blue water in the trade between Liverpool and New York. In this trade are the fastest and best vessels in the world, and therefore they are the proper standards of comparison for our cruizers. It is, of course, well known that our cruizers would do nothing going head to wind and sea, and that even a second-class mail steamer would lose them in a few hours. It is perfectly open for naval men to say they are not required to do so, and are not built for it. To this I have only to say, So much the worse; they may do well enough in peace time, but the very vessels that would be sent against us as privateers are the mail steamers of foreigners. This subject is treated more in detail in Chapter V. Nothing is known publicly of the speed of our men-of-war but the measured mile and six hours' trials. These always take place under the most favourable conditions as regards wind, sea, hand-picked coal, clean bottoms, and picked and unlimited stokers. The results, beyond affording a comparison between one ship and another, serve no practical end, though the widest publicity is given to them. The same

combinations can never occur on blue water, or, say, in six Atlantic voyages, winter and summer. Had that crazy rattletrap, the *Tourmaline*, been tried on only one winter's Atlantic voyage, it is difficult to believe five others would have been built. Indicated horse-power is another national fad. I suppose it gratifies the national imagination to be told that the *Shah* is 7,477 actual horse-power, but the information really is of small value. What is paid for is the nominal horse-power. One of the factors in calculating I.H.P. is the number of revolutions. If the maker thinks he is going to be short, he makes the screw of a finer pitch, and runs the engine faster, or puts a piece on the top of the funnel, or otherwise increases the draught of the furnaces. It does not follow the speed of a ship is increased; often the reverse. But the consumption is always increased, without any commensurate return. If two ships are of similar dimensions and draft, the main question about them is this, Which goes the fastest for the least coal?

The cost of a ship is the money spent on building her, *plus* the establishment and general charges. You cannot either build or repair a ship without a previous outlay for docks and machinery, nor can the superintendence or the constructive department be carried on for nothing. My estimate of 17 per cent. for building, and 38 per cent. for repairing, is fully explained in Table IV. National management is, and always must be, more expensive than private management. In one of the largest and best private establishments in the country, I am informed the charge is 25 per cent.

As regards the ships built in the Royal dockyards, I am clearly of opinion, without the least irreverence, that no one but the Almighty knows what they cost. In Table I. the cost is given of such of the ships as fall within the limits of the nine blue books 1867–68 to 1875–76. Accountants, as well as doctors, appear to differ.

As to the ships built in private yards, the price does not usually include the copper or zinc, the masts, spars, ropes, sails, anchors, or chains. In my estimate of cost of ships building, I put down £6 a-ton for this. The cost of the ships in Table V. is taken from Mr. Shaw Lefevre's Return, No. 297 of 1876, *plus* 17 per cent. for charges. It will be observed that the tonnage of men-of-war is given in B. M. (builders' measurement), and that of merchant-steamers as gross register. The measures are not the same, but they are the best that are attainable. B. M. takes no account of the depth, nor of any houses on deck; men-of-war have not, as a rule, houses on deck; merchant steamers have. Gross register takes in everything. Quite lately I have been assessed with 2·85 tons for the coamings of the hatches of a 400-ton vessel.

The fairest way to measure a vessel is that now in use by the Board of Trade—take the internal capacity of the hull and all the erections on deck, and divide by 100; call it tons.

The Admiralty have lately taken up the plan of classing their ships by tons displacement at the designed load draft. This is all very well; but if you alter the ship while building, or if after you have got her built you find she requires 180 tons of ballast, as the *Inconstant* and *Raleigh*, what is the value of the calculation? probably of small value. The coal consumption of the steamers is based on Welsh coal; it requires about one-third more of Lancashire or Scotch coal to give the same result as Welsh.

The draft of men-of-war is given as mean draft, because they are built so much by the stern. The largest class merchant-steamers don't vary above a few inches, so that really the *Shah* draws quite as much water as the *Germanic*. (*Vide* Admiral de Horsey's report of the fight with the *Huascar*.) The speed of all the more important war-ships is taken from the official papers, and the *Times* reports of the

trial trips. As regards the coal consumption, I have taken 2·4 lbs. per I.H.P. per hour for compound engines, 3·2 for those with surface condensers, and 4 for the remainder; they are probably within the truth. The blue-water speed of the Navy vessels is entirely out of my own head; not one of them, more's the pity, has ever been tried in the way an Atlantic mail-steamer is tried, and I reckon John Bull would open his eyes if they were. The speed of the Atlantic mail-steamers is perfectly well known, as each Company keeps a reckoning against the others; a Company that claims an hour shorter than it is entitled to is immediately contradicted in the newspapers. Now (1878) the two White Star steamers, *Germanic* and *Britannic*, are undoubtedly the fastest vessels on the Atlantic—or anywhere else. The coal they burn is a more delicate question; and probably more exaggerations, voluntary and involuntary, are spoken and written on this matter than on any other connected with shipping. A great deal of information on this may be found in the "Loss of the Atlantic," blue book. In Lindsay's 4th vol., "History of British Merchant Shipping," may be found the speed, carrying capacity, coal capacity, and consumption of all the Cunard steamers. This, as Mr. Lindsay observes, is nothing less in itself than a history of steam-shipping. Mr. Burns has rendered many services to his country; I venture to say, giving Mr. Lindsay that table was by no means the least conspicuous; I know no one else in Britain that could and would have done so much. The latest reliable information on this point is contained in a lecture delivered on January 30th, 1878, by Mr. Arthur T. Maginnis, before the Liverpool Engineering Society, "On Atlantic Steamships." He gives the consumption of the *Britannic* on an outward voyage of 7d. 10h. 53m., at 745·6 tons; allowing for cooking and condensing, this agrees very well with my table, 95 tons for 15½ knots.

If the blue-water speed of 15½ knots be considered an exaggeration, I invite attention to the following. The *Germanic* and *Britannic* have both made passages across the Atlantic at greater speed, and that without making any allowance for errors of compasses, errors of observation, and lee steerage.

In April, 1877, the *Germanic*, going west, made 410 knots in 24h. 55m. = 16·4 knots an hour; in October, 1877, going east, 394 knots in 23h. 26m. = 16·8 knots an hour.

The speed of the men-of-war, in the table, is at the draft given. It is important to bear this in mind. They would, on the measured mile, generally go faster at a lighter draft; for instance, the *Danäe*, at 14 feet, went 13·4 knots. The engines of all the men-of-war have horizontal cylinders, to keep the engines below the water-line; the merchant-steamers have vertical engines, as they are capable of a longer stroke, are much more effective, go straighter to their work, and cost less for repairs. It will be noticed that men-of-war engines have but a short stroke; the *Iris* has only 36 inches for 500 horse-power, the *City of Brussels* has 60 inches for 500 horse-power.

Tables II. and III. will be best studied by looking at them together. The first shows the money spent on each ship in each year; the second, whether the ship was at work or not. The total in Table II. has 38 per cent. included, as explained under the head of general charges.

Table III. is made by taking 44 back numbers of the Navy List, and noting whether the ship was in commission or not. There are four strokes for the four quarters of the year; a blank signifies the ship was in reserve or under repair. If any of the new ships have been commissioned a few days after the quarter, I have given them the advantage of the whole quarter. The fault of this table is, that it gives the ships credit for more work than they really do; a ship may be commissioned, and it may take months to get her engines

to go, such as the *Shah*, or *Danäe*; or a ship may come home broken down, after having been only a short time away, and spend months getting away again, such as the *Tourmaline* and *Sirius*. The table must be taken for what it is worth, remembering that it favours the ships. The large sum to the debit of the *Volage*, in Table II., is owing to her having been ashore, both at Kerguelen's Land and in the Suez Canal. How much is due to each I have no means of knowing; but it is proper to observe, had she been built of iron without any plaster of wood, she would most likely have suffered no damage in the Canal.

CHAPTER II.

TABLE I.

SHIPS BUILDING AND COMPLETING.

	1867-8	1868-9	'69-70	1870-1	1871-2	1872-3	1873-4	1874-5	1875-6	Ch'rges 17 °/o	TOTAL.
ACTIVE	24,255	82,730	21,194	3,420	245	226	Cr. 971	3		22,457	£154,557
AMETHYST					17,830	38,957	20,475			13,134	90,396
DIAMOND						1,840	34,788	39,832	9,315	14,580	100,350
ENCOUNTER					22,344	36,342	12,313			12,070	83,070
MODESTE					10,993	40,759	27,989			13,547	93,237
OPAL							17,921	54,794	39,760	17,419	119,894
OSBORNE		2,969	11,069	45,191	13,309	7,326	10,088	16,896	51	18,006	123,926
RALEIGH				4,263	62,342	73,150	59,172	11,295		35,787	245,959
ROVER						12,876	86,285	64,448	14,484	30,266	208,809
TENEDOS	8,688	7,353	25,436	22,807	1,026					11,094	76,354
THALIA	9,631	24,337	23,953	11,592	6					11,772	81,021
THETIS				17,896	39,908	13,929	Cr. 4			12,295	84,024
SHAH			4	21,183	89,536	85,143	53,828	43,640	4,310	42,099	289,743
VOLAGE	21,850	90,591	19,851	535						22,580	155,407

The items of this table are taken from the Blue Books, Shipbuilding and Dockyard transactions. It serves to show the disparity that exists between two sets of Government accounts.

Assuming the cost of a vessel to be the money spent on building her, *plus* the general charges; it may be seen, *inter alia*, that the *Raleigh* cost over £19,000 more than the sum given in Parliamentary Paper 297 of 1876; the *Rover* over £20,000, the *Amethyst* over £9,000, and the *Osborne* £7,816 more.

TABLE II.

WEAR AND TEAR, AND MAINTENANCE IN COMMISSION AND RESERVE.

	1867-8	1868-9	'69-70	1870-1	1871-2	1872-3	1873-4	1874-5	1875-6	Ch'rges + 88 %	TOTAL.
ACTIVE	287		1,658	1,279	578	86	7,964	1,123	16	4,937	£17,928
AMETHYST							2,720	2,381	268	2,040	7,409
BLANCHE	2,272	3,593	3,179	3,322	2,258	606	2,365	1,246	Cr. 2,891	6,061	22,011
BRITON			90	1,145	1,886	42	2,450	1,761	613	2,769	10,056
CHARYBDIS	1,321	3,304	849	260	Cr. 2,393	10,827	26,659	3,261	1,287	17,223	62,548
DANAE	8,046	36	789	847	1,854	1,563	1,140	Cr 2,852	21,605	10,651	38,679
DAPHNE	2,443	1,166	817	88	17,159	669	2,100	2,317	533	10,371	37,663
DIAMOND								134	2,532	1,013	3,679
DIDO			290	1,127	1,381	698	1,967	2,624	1,559	3,665	13,311
DRUID			185	1,248	1,928	1,063	787	5,408	697	4,300	15,616
DRYAD	2,186	759	1,188	1,230	1,245	Cr. 1,561	3,469	22,890	715	12,206	44,327
ECLIPSE	527	1,862	788	1,400	1,083	2,905	24,748	655	881	13,552	48,402
ENCOUNTER						5	2,518	2,123	1,943	2,504	9,093
INCONSTANT		13	5,381	5,836	3,984	Cr. 2,860	7,100	1,094	498	7,997	29,043
JUNO	72	3,263	2,580	3,539	330	895	Cr. 2,848	7,186	28,890	15,426	59,131
MODESTE							2,710	720	2,888	2,211	8,029
NYMPHE	2,842	3,353	Cr. 268	2,938	Cr. 1,313	8	8,988	24,554	967	15,984	58,048
OPAL									3,013	1,145	4,158
RALEIGH							1,862	7,231	3,169	4,660	16,922
ROVER								173	3,846	1,527	5,546
SAPPHIRE								615	2,343	1,124	4,082
SHAH								7	1,229	470	1,706
SIRIUS		936	1,431	615	1,648	1,057	366	20,267	18,374	16,705	60,667
SPARTAN			2,173	459	670	635	1,238	1,455	17,546	9,187	33,363
TENEDOS			1	1,576	215	1,260	600	1,600	Cr. 45	1,979	7,186
THALIA				2,093	4,465	2,121	297	3,160	1,200	5,068	18,404
THETIS						2,425	1,153	888	36	1,711	6,213
UNDAUNTED	16	290	9		9,855	1,918	2,995	6,282	2,073	8,895	32,328
VESTAL	185	743	1,623	1,637	Cr. 751	Cr. 356	Not Given.	18,027	16,927	14,453	52,488
VOLAGE			2,006	2,802	2,152	1,563	5,262	12,558	5,188	11,982	43,513
WOLVERINE	Cr. 2,551	1,100	17,537	2,979	933	82	3,277	3,511	21,163	18,252	66,283

TABLE III.

NAVY.—SHIPS IN COMMISSION.

Launched.	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878
ACTIVE.....1869												
AMETHYST 1873												
BLANCHE.....1867												
BOADICEA 1875												
BRITON 1869												
CHARYBDIS.....1859												
DANAE 1867												
DAPHNE..... 1866												
DIAMOND 1874												
DIDO 1869												
DRUID 1869												
DRYAD 1866												
ECLIPSE 1867												
EMERALD 1876												
ENCOUNTER ...1873												
EURYALUS 1877												
INCONSTANT ...1868												
JUNO 1867												
MODESTE 1873												
NYMPHE 1866												
OPAL 1876												
RALEIGH 1873												
ROVER 1874												
RUBY.....1876												
SAPPHIRE 1874												
SHAH 1873												
SIRIUS 1868												
SPARTAN 1868												
TENEDOS 1870												
THALIA.....1869												
THETIS.....1871												
TOURMALINE...1875												
TURQUOISE.....1876												
UNDAUNTED ...1861												
VESTAL 1865												
VOLAGE 1869												
WOLVERINE ...1863												

TABLE IV.

NOT IRON-CLAD.

GENERAL AND ESTABLISHMENT CHARGES.

Column I.—Building.

Column II.—Wear and tear, and maintenance in commission and reserve.

	1867–8	1868–9	'69–70	1870–1	1871–2	1872–3	1873–4	1874–5	1875–6
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
I.	22	18	Not	Not	22	21	15	9	14
II.	35	47	Given	Given	46	45	35	29	30

Average, 17 °/₀ for building, 38 °/₀ for keeping-up.

In the various Blue Books these charges are only given as a lump sum; no attempt is made to show the charges due to each ship. It is evident that no estimate of the cost of a ship can be of any value without including these charges, and they are inserted in this form, not because they are correct, but as being the best attainable, in the present way the Dock-yard accounts are made out.

Thus, in the year 1874–5, in Blue Book No. 181 of 1876, page 88, the accounts are:—

Building cost	£785,997	Charges	£75,956	=9 °/₀
Wear and Tear:				
Commission	312,751	"	98,177	=29 °/₀
Reserve	314,958	"	84,104	
	£627,709		£182,281	

Similarly for all the other years. The mean is taken, for no ship is built in less than three years, and it affords a fairer comparison.

TABLE V.

Navy Unarmoured Ships of 1,000 tons B.M. and upwards. Ranged in their order of size and in classes.

	Launched.	Builder.	Tons. B.M.	Length, p.	Breadth, ex.	Mean draft.	Engine Maker	Cylinder and Stroke.	H. P. nom.	Type.	Speed on paper. Knots.	Coals for this daily.	Carries of Coal. Tons.	Probable sea-water speed.	Days' Coal.	No. of Crew.	Cost P. P. 97 of 1876 + 17 per cent. for charges.	Built of.	Notes.
SHAH.....	1873	Portsmouth	4,210	335	52·	23·7	Ravenhill	2 of 116½ by 48	1,000	Comm.	16·	260	600	13	4½	550	£269,595	Iron, coppd.	1
INCONSTANT..	1868	Pembroke	4,066	337	50·6	22·7	Penn	Cyls. 112 / Tr'nk 41 } by 48	1,000	Do.	16·5	270	600	13½	4½	550	249,588	Ditto	9
RALEIGH.....	1873	Chatham	3,215	298	48·6	23·4	Humphreys	2 of 100 by 54	800	Do.	15·3	220	540	12½	5		226,262	Ditto	
IRIS.....	1877	Pembroke	about 3,050	300	46·	18·2	Maudslay	4 of 41 / 4 of 75 } by 36	1,000	Compd.	16·0	205	500	13½	5	250	217,620	Steel.	Dble. Screw [1, 2
HECLA	1878	Harland & Wolff	2,895	390	38·6	23·6	Forrester	2 of 28 / 2 of 60 } by 54	300	Do.		37	620	11·4			73,000	Iron.	10
BOADICEA.....	1875	Portsmouth	2,679	280	45·6	21·11	Rennie	1 of 73 / 2 of 92 } by 48	700	Do.	14·8	140	400	12	6	350	250,380	Iron, coppd.	4
BACCHANTE...	1876	Ditto	2,679	280	45·6		Ditto	Ditto	700	Do.	Not yet tried.		400			350		Ditto	
EURYALUS ...	1877	Chatham	2,679	280	45·6		Ravenhill		700	Do.	Not yet tried.		400			350		Ditto	
ROVER	1874	Thames Iron Works	2,404	280	43·6	20·4	Ditto	1 of 72 / 2 of 88 } by 48	700	Do.	14·5	130	400	12	6	325	188,186	Ditto	1
VOLAGE.....	1869	Ditto	2,322	270	42·	18·11	Penn	Cyls. 93½ / Tr'nk 36½ } by 48	600	Comm.	15·4	160	400	12¾	5	300	147,598	Ditto	
ACTIVE.....	1869	Ditto	2,323	270	42·	18·11	Humphreys	2 of 80 by 48	600	Do.	15·	150	400	12½	5½	300	148,707	Ditto	
OPAL	1875	Doxford	1,668	220	40·	17·10	Napier	57 & 90 by 33	350	Compd.	12·2	53	260	9½	10	220	101,205	Composite.	1, 3
TOURMALINE	1875	Dixon	1,668	220	40·	17·9	Hawthorne	Ditto	350	Do.	12·6	53	260	9½	10	220	95,791	Ditto	1
RUBY.....	1876	Earles Co.	1,668	220	40·		Earles Co.	Ditto	350	Do.		53	260	9½	10	220		Ditto	
TURQUOISE...	1876	Ditto	1,668	220	40·		Ditto	Ditto	350	Do.		53	260	9½	10	220		Ditto	
EMERALD.....	1876	Pembroke	1,668	220	40·		J. & G. Thom[son]	Ditto	350	Do.	Not yet tried.		260	9½	10	220		Ditto	
GARNET	1877	Chatham	1,668	220	40·		Hawthorne	Ditto	350	Do.	Not yet tried.		260	9½	10	220		Ditto	
WOLVERINE..	1868	Woolwich	1,703	225	40·9	15·3	Ravenhill		400	Comm.	12·5	66	270	10			99,334	Wood.	
CHARBYDIS...	1859	Chatham	1,506	200	40·4				400	Do.	10·	63		8			71,726	Ditto	
JUNO.....	1867	Deptford	1,462				Humphreys	2 of 64 by 32	400	Do.		59					84,778	Ditto	
THALIA.....	1869	Woolwich	1,459	200	40·4	17·6	Napier		400	Do.	11½·	55	232	9½		8·	81,459	Ditto	

AMETHYST ...	1873	Devonport	1,405	220	37·	16·3	Rennie	55¼ & 97½ by 33	350	Compd.	13·2	56	250	10½	9	220	£81,869	Ditto	5
DIAMOND	1874	Sheerness	1,405	220	37·	15·9	Hawthorne	57 & 90 by 33	350	Do.	13·	56	250	10½	9	220	85,761	Ditto	1
ENCOUNTER..	1873	Ditto	1,405	220	37·	15 4	Rennie	55¼ & 97½ by 33	350	Do.	13·1	56	250	10½	9	220	78,825	Ditto	
MODESTE.....	1873	Devonport	1,405	220	37·	16·1	Napier	57 & 90 by 33	350	Do.		56	250	10½	9	220	83,785	Ditto	
SAPPHIRE.....	1874	Ditto	1,405	220	37·	15·9	Hawthorne	Ditto	350	Do.	11·3	56	250	10½	9	220	85,761	Ditto	1
BRITON	1869	Sheerness	1,881	220	36·	15·3	Rennie	57 & 100¼ by 33	350	Do.	12·8	48	240	10¾	8		70,965	Ditto	6
DRUID	1869	Deptford	1,322	220	36·	14·7	Maudslay	2 of 67 by 33	350	Comn.	13·	75	300	10¾	8		65,548	Ditto	
THETIS.....	1871	Devonport	1,322	220	36·	14·11	Rennie	57 & 100 by 33	350	Compd.	13·4	55	240	10¾	8		76,182	Ditto	
BLANCHE.....	1867	Chatham	1,268	212	36·	15·1	Ravenhill	2 of 68½ by 33	350	Comn.	13·6	73 for the class.	270	10½	8	200	76,269	Ditto	
ECLIPSE	1867	Sheerness	1,273	212	36·	14 4	Penn	Cyls. 70 / Tr'nk 30 by 36	350	Do.	13·4	Do.		10½	8		74,091	Ditto	7
DANAE.....	1867	Portsmouth	1,287	212	36·	15·3	Napier	2 of 64 by 33	350	Do.	12·6	Do.	230	10½	8		75,822	Ditto	
DIDO	1869	Ditto	1,277	212	36·		Humphreys	Ditto	350	Do.	13·7	Do.		10½	8		65,509	Ditto	
SIRIUS.....	1868	Ditto	1,268	212	36·		Maudslay	2 of 34 / 2 of 75 by 33	350	Compd.	13·1	56 for the class.	230	10½	8		72,485	Ditto	
SPARTAN	1868	Deptford	1,269	212	36·	14·10	Rennie	57 & 90 by 33	350	Do.	12·3	Do.		10½			65,016	Ditto	
TENEDOS.....	1870	Devonport	1,275	212	36·		Elder	Ditto	350	Do.	13·	51		10½			69,486	Ditto	6
VESTAL	1865	Pembroke	1,081	187	36·	15·10	Maudslay	3 of 55 by 30	300	Comn.	12·1			10	7	180	71,009	Ditto	8
NYMPHE	1866	Deptford	1,084	187	36·		Ditto	Ditto	300	Do.				10	7		74,026	Ditto	
DAPHNE	1866	Pembroke	1,081	187	36·		Ravenhill			Do.	12·8	66		10	7		68,183	Ditto	
DRYAD	1866	Devonport	1,066	187	36·	16·3	Napier	2 of 68 by 30	300	Do.	11·9		225	10	7		65,622	Ditto	

1. Accounts of cost incomplete.
2. This is the speed and coal consumption on the 6 hours' trial. On the measured mile the speed was 16·4. She has since gone 18·6 knots *(see p. 28)*.
3. This is the writer's estimate of coal consumption, based on 2·5 lbs. per I.H.P. per hour, on an average of four ships and 1,977 I.H.P.
4. This is the estimated cost of *Boadicea*, + 17 per cent. for charges.
5. The estimated coal consumption of these five vessels is based on 2·4 lbs. and 2,198 I.H.P.
6. This is the Admiralty return of the competitive trial of *Briton* and *Tenedos*, with a view to economy of fuel. The *Briton* was the first vessel in the Navy with compound engines.
7. The engines of the *Eclipse* were exhibited at Paris in 1867. They were one of the chief objects of interest in the machinery annexe.
8. This is the paper speed of the *Vestal* after she was almost rebuilt in 1874.
9. The *Inconstant* has lately had the weights on the boilers reduced, which has taken 2 knots off her paper speed.
10. The *Hecla* is much the strongest vessel of the whole list, having two complete iron decks. In addition to the 620 tons in the bunkers, she has, at the draft given, a dead weight capacity of 3,750 tons. Allowing the half of this for armament, it is quite easy to see that she may have a coal endurance of *60 days* at 11½ knots. The speed and consumption given in the table are based on the performance of the sister ship *(British Empire)* on her first Atlantic voyage. The price given is her price as a merchant ship.

There are only seven vessels building, the *Mercury*, sister to the *Iris*, to be launched in April, 1878, and six corvettes, which may possibly get into work by the middle of 1879, and which are fully described in the chapter on the Constructive Department.

TABLE VI.

ATLANTIC MAIL STEAMERS SAILING FROM LIVERPOOL, RANGED IN THEIR ORDER OF SPEED.

	Launched.	Owners.	Builders.	Length.	Breadth.	Draft.	Speed on big water. Knots.	Coals for this Daily.	Tons Register. Gross.	Engine Makers.	Cylinders & Stroke.	H.P. nom.	Coal in Bunkers.	Cargo, dead weight. Tons.	1st Class passengers.	No. of Crew.	Value when new. (Author's Estimate.)
GERMANIC	1875	White Star Co.	Harland.	455	45·3	26	15½	95	5,004	Maudslay.	2 of 48 / 2 of 82 × 60	760	1,100	3,900	200	140	£185,000
CITY OF RICHMOND	1873	Inman Co.	Tod & M'Gregor.	441	43·5	26	15	90	4,607	Tod & M'Gregor.	76 & 120 × 60	700	1,050	2,900			£165,000
BALTIC	1871	White Star Co.	Harland.	420	40·7	24	14¼	75	3,707	Maudslay.	2 of 40 / 2 of 78 × 60	550	900	2,400	160	120	£130,000
CITY OF BRUSSELS	1869	Inman Co.	Tod & M'Gregor.	390	40·3	25	13¾	110	3,775	Tod & M'Gregor.	Horizon. Tr'nk 2 of 91½ × 48	600	1,300	1,600	150	120	£125,000
Do. Compound Engines in 1876							13	60		Forrester.	35 & 75 × 60	500	850	2,400			
RUSSIA	1867	Cunard Co.	J. & G. Thomson.	358	43	23	13½	95	2,960	J. & G. Thomson.	2 of 87 × 48	492	1,180	1,260	180	140	£105,000 1
CHINA	1862	Ditto.	Napier.	326	40·4	23	12¾	80	2,529	Napier.	2 of 80½ × 66	484	1,100	1,050	160	120	£85,000
Do. Compound Engines in 1874							12	46		Barclay Curle.	51 & 86 × 48	420	690	1,500		108	
OTHER STEAMERS.																	
MEDWAY	1877	Royal Mail Co.	Elder.	382	42	21	11	32	3,687	Elder.	59 & 103 × 60	600	800	1,200	200		£115,000 2
KENT	1876	Wigram.	Wigram.	275	39	23	9	14	2,304	Humphreys.	36 & 80 × 48	300	750	1,100	All classes. 400	90	£70,000 3
PRINCESS ROYAL	1876	Langlands.	L'don & G'gow Co.	227	29·2	14·6	13¼	24	876	L'don & G'gow Co.	32 & 57 × 48	220	60	500	Ditto. 150	35	£28,000

1. The *Russia* is the only vessel in the list with common engines.
2. This is about the speed and draft of the *Medway* for the Mail contract. At 24 feet draft, she could carry 2,000 tons weight + 900 coal. Her top speed on trial was 16·1.
3. The *Kent* will steam 11 knots for 30 tons, but as she goes to Melbourne without stopping, 9 knots gives the best result for the quantity of coal carried.

NAVAL SHIPBUILDING.

CHAPTER III.

THE chief fault of the Constructive Department is, that they know nothing about ships. They are perversely blind to what is going on around them, and have one fixed idea, viz., that the Constructive Department is the finest in the world, and that they have nothing to learn from the outside. The result is, that their ships are twenty years behind. These remarks are not to apply to Mr. Barnaby or Mr. Wright; it were easy to show they are men of great ability. As to the first, the central bulkhead down the middle of the engine-room, and turning the mouths of the furnaces towards the wings, is an invention of real merit. I refer to H.M.S. *Nelson*. As to Mr. Wright, I will only point to his evidence in Lord Dufferin's Blue Book, questions 3,578 to 3,580, *apropos* of the application of the Corliss valve to the marine engine. It turned out prophetical, for the Corliss arrangement was tried in one of our Atlantic mail steamers five years *after* Mr. Wright's evidence, and was a failure. It had to be taken out, and gave place to the ordinary compound engine. It appears to me that these men are set to do things, and combine different things in one ship, which are hopelessly impracticable, and that they have only to take the materials given them, and knock them into shape as well as they can. There is a lot of interesting information on this point in Lord Dufferin's Blue Book, c. 477, 1872. I have no animus against the Constructive Department; my task is simply this, to take the ships as I find them, the

official figures, and to endeavour to show how excessive is their cost, how deficient their endurance, and how inferior they are to our mail steamers. All this has often been pointed out by men such as Seeley, Thomas Brassey, William Pearce, and many others. The official mind is not in the smallest degree disturbed, and whether in the House of Commons or in print, their reply is pretty much as follows:—"The requirements of H.M. Navy and the character of the ships are so different to anything in the mercantile marine, that there is no analogy, and no bases of comparison between them;" and if this is not sufficient, the assertion is roundly made, as the close of all argument, "that the Constructive Department is not only the best, but the model of the world." (*Vide* the Controller's speech at Glasgow, at the launch of the *Northampton*, "Times," Nov. 20th, 1876.)

In order to speak of facts within my own observation, let us go back twenty-five years, and what do we find? Look at the persistent way the Navy have built wooden screw-steamers, after every sane man had given up wood altogether. The Cunard Company, the most successful, as it is also the most conservative of all, have built nothing of wood since the *Arabia* in 1852. Mr. W. S. Lindsay, in his admirable 4th volume "History of British Merchant Shipping," p. 98, does not fail to point out, that in 1861, that is, nine years afterwards, the then Government demanded and got from Parliament £949,371 to replenish the stock of wood, to build wooden ships; and they have gone blindly on building of wood up to 1874, the *Diamond*, 1,405 tons; or twenty-two years after the very highest authority had given it up. If we look at the relative endurance of the wooden frigates and the wooden Cunarders, the evidence shows immeasurably in favour of the Cunarders, because they have been well looked after, and kept filled with rock-salt between the frames, which most vital plan the Navy have always, and still persist-

ently ignore. The *Niagara*, after nineteen years' service, was in 1867 converted into a sailing-ship, and classed A 1 in red at Lloyd's for five years. The *Canada*, built in 1848, was similarly treated, and classed at Lloyd's A 1 for eight years in 1869; the *Asia*, built in 1850, classed at Lloyd's A 1 in red seven years in 1869. The first was wrecked, the last two were still at work in 1876, and, for all I know, are yet. The class given to them shows that they were at the time, and likely to be for the periods assigned, "fit to convey dry and perishable cargoes to and from all parts of the world."

Will any apologist of the Navy kindly point out any wooden ship that has done one-tenth of the same work?

If the Crimean war taught anything, it taught this, that the iron screws had far the best of it; the wooden screws were always in trouble. I perfectly remember that Lord Lyons' flag-ship, *Royal Albert*, got so leaky in the stern, that she had to be beached on the island of Zea, to avoid foundering. It is talked of yet, the way the Inman steamer, *City of Baltimore*, towed the large American ship, *Great Republic*, up to Kamiesh, often making nine knots with her. The *City of Baltimore*, with new engines and boilers, is still an efficient ship, and runs to Bombay. Did the Navy lay these lessons to heart? Not one bit. In 1858 out came a lot of wooden frigates, *Mersey*, *Orlando*, *Ariadne*, &c., and of which the *Mersey*, 300 ft. by 52 ft., 3,733 tons, and 1,000 horse-power, may be taken as a type. She had a paper speed of about 14 knots, but then the vibration was such that had you kept her at full speed for a week she would have shaken to pieces, and it was unsafe to send the men aloft, for fear of shaking them out of the rigging. Her model was admirable for a sailing-ship—how she walked to windward in Mr. Childers' cruise with the Naval Reserve!—but entirely unsuitable for a steamer, as was also the material of which she was built. Beyond running over the measured mile,

she never did any real work. She cost, excharges, £148,716, or say £174,000; was sold in 1875 for £13,065 10s., and broken up for dry rot. If it be said, this is exceptional, and that a few such as the *Immortalité* and *Topaze* have been in work up to 1876, the reply is easy, and it is this: The money spent in repairs would have built new iron ships. Others, such as the *Aurora*, launched in 1861, though kept on the active list, have long been rotten and unseaworthy. (See Parliamentary Papers on the *Vanguard*.) We now come to 1868, the era of iron ship-building, and the *Inconstant;* and to listen to Admiral Robinson and Mr. Reed, there never was such a ship. The cost (see Table V.) was a few pounds short of a quarter of a million, or about as much as three really staunch ships of 3,000 tons, the same blue-water speed, and five times as great coal endurance. Her design is a blunder, for she has no structural strength, and no respectable registry would give her a class. Her frames are 42 inches apart, and the bulk of the plating is only half-inch. An Atlantic steamer of the same size would have her frames 24 inches apart, and the bulk of the plating $\frac{1}{2}\frac{1}{8}$. We are told that this "tea-kettle plating" is compensated for by the double bottom, and that the frames are deeper than an ordinary vessel. It is nothing of the kind. Suppose the frames were even 3 feet deep, the distance between the points of support—42 inches—is the same. As for the double bottom, all ships that carry water ballast are double or partially double-bottomed; and what deduction do my readers think a respectable registry, such as Lloyd's, will allow on the outside plating for this? If the normal plating is $\frac{1}{2}\frac{8}{8}$ or over, $\frac{1}{16}$ off; if under $\frac{1}{2}\frac{8}{8}$, no reduction. No reduction in frames, and none in plating beyond $\frac{1}{16}$ is allowed in any case. The wood sheathing is also put forward as contributing to her strength, but it is only a plaster; the lower tier of wood is fastened to the *plating*, the outer tier of wood is only fastened

to the under tier of wood. The *fons et origo* of all strength in planking is, that it be through fastened, that is, to the timbers or frames. The next fault, perhaps the worst, is deliberately going and coppering an iron ship—it is taking a viper into your bosom. I am told it has proved so in this case, and on excellent authority.

No iron merchant-steamer of any of our mail companies has ever been coppered. If the reader will turn to Tables II. and III., he may see she has been in commission 3¼ years, and up to date, 1875–76, £29,043 have been spent on her. Since Nov., 1872, she has lain eating her head off in Portsmouth Harbour; and this, be it remembered, at a time when Mr. Ward Hunt said he wanted ships for his reliefs, and could not get them.

Had she been fit to send to sea, she might have gone and salted five hundred boys, "who are cooped up in harbour ships and learning little but evil."

The folly of building the ship of this "slimness" is the more apparent, when we consider she has to carry 180 tons of ballast in her bottom. Not that it is any detriment to a ship to have to carry ballast; the tea clipper, *Sir Lancelot*, carried 100 tons of cast-iron ballast between the frames; but a large part of this would have been saved had the plating and frames in the bottom of the *Inconstant* been of rational strength.

The *Shah* was designed with more beam, to avoid the necessity of ballast, but even constructors make mistakes, as she had to take 90 tons.

The *Shah*, a similarly-built vessel to the *Inconstant*, has never been able to go six hours at full speed, even in calm weather, without something giving way, from the simple fact that the hull is not staunch enough to carry the engines.

Supposing even the *Inconstant* were as staunch as the *Russia*, she could not be in three places at once, and if

you spend three shillings instead of one shilling, is not this, in the strictest logic, the position to which you reduce yourself?

The *Inconstant* — questions of rattletrapism apart — may be summed up in one sentence. She is useless to fight an ironclad, as she carries no armour; she is useless to protect commerce, from her small coal endurance. And yet how often have we been called upon to fall down and worship this brazen image, which Reed and Robinson have set up?

A quarter of a million, for *one* monument of the folly and recklessness of the Constructive Department, is dear, even for England.

In some of the later vessels the plating has been made five-eighths, but this is still sadly too little, the frame-spacing is the same, even in the vessels building, viz., 42-inches.

I wish to say a few words here about the yacht *Osborne*, launched in 1870. To the department which is "the model of the world," it might be reasonably thought that the building of a yacht of 1,536 tons presented no particular difficulty. Her estimated cost, by Parliamentary Paper 361 of 1872, was, hull, £60,100, or more than twice what a really good iron one might be built for; furniture, &c., £11,493; engines, £22,050. These last two items are reasonable; the engines are Maudslay's, and are cheap. If the reader will look at Table I., he will find the total £123,926. An Atlantic mail steamer of 4,000 tons, 14-knot speed, and fittings, plate, linen, &c., for 120 first-class passengers, could be built for less.

The history of the vessel is briefly this. She is built of wood, and the Constructive Department excelled itself in the matter of "slimness" on this occasion, the result being that she was as leaky as a basket on going round from the building-yard to Portsmouth, and had to be put in dock there, her new metal stripped off, and doubled with 3-inch teak. She was

not commissioned till May 1874. She has been to India and back, to the Mediterranean once, to Cronstradt once, and an occasional odd job to Antwerp. In the two years up to 1875-76, the last published Blue Book, a further sum of £24,444—for I omit the £1,934 debited to the Prince of Wales, as no one grudges that—in keeping her up. Nor is this all; her planking is now said to be decaying, and to require heavy repairs. I can point out a dozen private builders who would have felt honoured to build a yacht for Royalty, as large and swift as the *Osborne*, and a staunch job, for £60,000. The net result of this *tour de force* appears to me to be that the country is £90,000 poorer, *plus* an unknown amount for keeping the ship up, which time and blue books will no doubt tell us. Admiral Fanshawe, in a defence of dockyard management (see *Times*, October 6th, 1875), describes this ship "as superior to anything afloat;" if he had to make his living with ships, he would think differently. Some independent M.P. might ask with advantage to which of our constructors are we indebted for the design of this ship. There are only two vessels in the frigate list that have done satisfactory work, viz., the *Active* and *Raleigh*; the *Volage* is perhaps the same, but my information is not sufficient to enable me to express an opinion. Following down the list we come to the composite "gems," of which the *Tourmaline*, launched in 1875, may be taken as a type. Two of them, *Garnet* and *Emerald*, are not yet at work. The *Tourmaline* made her trial trips about the end of 1876, and they were so successful that the correspondent seems to have exhausted his stock of superlatives in describing them. She went out to the Cape, and on the way met with very bad weather. In the *Times*, of April 7th, 1877, there is an account of the voyage from an officer on board, and a more deplorable picture of one of H.M. ships would be difficult to realise. There were not wanting apologists who said the letter was anonymous, and

the writer knew nothing of machinery, &c. Had the writer put his name to it, it would have ruined him, but the fact of the letter appearing in the *Times* is to me quite a sufficient guarantee of its authenticity, and I take leave to say the writer and editor both performed a truly patriotic duty. As to the want of knowledge of machinery, I have this one observation to make. As regards the lowering the screw, he speaks on a question of fact, and says they could not get the screw down except the ship was upright; all the apologists in the world can only make of this, that the ship altered her shape when laying over; in other words, was a rattletrap.

A correspondent on board the *Active* states that the *Tourmaline* could hardly steam into Simon's Bay. The sequel to the story is as follows:—The *Tourmaline* had to come home for repairs as soon as the ship she went out to relieve could be got ready to take her place. She arrived back at Plymouth on 22nd August, 1876, and was sent to Sheerness, where some £5,000 was spent on repairs. She got back to her station, this time the West Indies, Barbadoes, on the 7th March, 1878.

The next apology naval men have, and it is a very common one, "It is the fault of the contractor." (*Vide* Admiral Richards' letter to the *Times*, August 22nd, 1877.) "The efficiency and promptitude of naval administration have never been found wanting," &c., and then refers to the "rough and ready" method of occasionally hanging a contractor. It appears to me that this "rough and ready" plan might with more justice be first tried on an admiral or constructor, *pour encourager des autres*. I wish here to point out that the contractor of the *Tourmaline* is no more responsible for the failure of the ship than I am, and the precise relation in which the builders stand to the Admiralty. In this case Mr. Vernon Lushington wrote Dixon & Co., the builders, as

follows:—"I am commanded by my Lords Commissioners of the Admiralty to express to you their satisfaction at the highly creditable manner in which (the) contract for the *Tourmaline* has been carried out by you." Dixon & Co., of Middlesborough, are known as one of the best builders in the kingdom; a friend of mine has had several steamers built by them, which have all turned out well. Another friend of mine, one of the principal surveyors in Britain, told me, in October, 1877, that he had just been in Dixon's yard, and the work there done was equal to anything on the Clyde or Mersey.

The *Opal*, another "gem," made seven trial trips unsuccessfully. She sailed in Feb., 1876, for the Pacific, and had to put back twice owing to bad weather. She ran foul of a ship at Madeira, and ashore in Smith's Channel, because the engines could not be got to work properly. She again broke down at Valparaiso; and is an entirely lame duck. Even Mr. Ward Hunt was obliged to confess in the House of Commons "that her engines had given a great deal of trouble, and were in an unsatisfactory state." The engines of the *Opal* are by Napier, and it is superfluous for me to point out that there is no better maker in the world. The fault of the "gems" is in the design; the engines are absurdly cramped up in the bottom of the ship, the boilers are too small, and the hulls are structurally weak. No engine can work if the hull is not staunch enough to keep its shape. As to the relation of the builders to the Admiralty, here are the words of one of the most distinguished builders, to me, on this matter.

I asked him if the Admiralty ever sought the advice of the builders they went to, and he replied, "Certainly not." With shipowners it is exactly the reverse. The builder then added, "Of course we know well enough that they are throwing away their money, and that they are spending as

much money on one ship as would build two better ones; but that is not our business. The first thing you have to learn in dealing with the Navy is, that their ideas are as far beyond ours as the sun is brighter than the stars. All we have to do is to carry out their specifications. We are in the same relation to them as a tailor is to his customer. If you go to a tailor, and say, 'I want a dress coat,' he does not say, 'No, sir, you had better have an ulster." We are not ashamed of our work; our yard is open, and anyone can come and look at it. You have seen it yourself; have you anything to say against it ?" I had much pleasure in replying that I had never seen better; but, by-and-by, when these ships break down, as they certainly will if they have work to do in bad weather, some naval officer will tell us, not that the design is bad, but, "It is a failure of the contractor."

It would be only a waste of time criticising our wooden corvettes and sloops, as even the Admiralty have come to see that wood as a material for shipbuilding is a thing of the past. It is sufficient to refer my readers to Tables II. and III., whence they may see for themselves that before one of them has served ten years, more money has been spent on repairs and keeping up than would have sufficed, if rationally spent, to have built a new iron ship of a similar kind.

A few remarks are here appended on the gunboats. They are of no value to protect commerce, and do not strictly fall within the limits of my task, but they may serve to show how the department carries out the principle, "nullum quod tetigit non ornavit," down to the end of the piece. There are in the Navy List seventeen double-screw composite gunboats, called gunboats of the first class, in that excellent little book, "Almanach für S^{r} Maj. Kriegs-Marine," published at Pola; their names are *Avon*, *Beacon*, *Boxer*, &c. In a recent book, "The Two Americas," by Sir Rose Price,

Bart., Major Royal Marines, there is an account of two of them, the *Rocket* and *Boxer*. Sir Rose Price made the passage from England to British Columbia, *via* the Straits of Magellan, in the *Rocket*, and as he has served in various parts of the world, and travelled to and fro in mail steamers, is quite a competent witness as to a ship's efficiency. The average speed of the *Rocket*, steam or sail, was four knots; average leeway, two and a half points (p. 3). The *Boxer* took ninety-six days to go from Esquimalt to Callao (p. 94); the *Rocket* took, in the Straits of Magellan, five weeks to do the distance an ordinary mail steamer does in five days, and a battering charge from the 7-inch gun invariably tore up everything about it. It is hard to see how a vessel with such beam in proportion to her draft could be of any service; or that a double screw in a vessel of 465 tons and 120 horse-power, can be anything else than an absurdity; it is sufficient for me to point out that Mr. Brassey's yacht, *Sunbeam*, which is a smaller vessel and of less power than the *Rocket*, went through the Straits in seventy-four and-a-half hours' steaming, seven days in all, anchoring every night. (See "Nineteenth Century," December, 1877, p. 780.)

If we look at the vessels building, the course pursued is the same—recklessness of cost, and inability to render any service proportionate to the cost. The two despatch vessels, *Iris* and *Mercury*, and six corvettes of the *Comus* class, are all we have building; the *Iris* has just been tried, the *Mercury* is to be launched this month (April, 1878). The remarks I have to make on the *Iris* apply equally to the *Mercury*, as they are sisters. The *Iris*, with the exception of the Z longitudinals, is built entirely of steel, which cost about £20 a-ton—or say two and a half times the price of iron. The reduction in scantling allowed by Lloyd's for steel is one-fifth. She is 300 feet and 46 feet and 19 feet 6 inches mean draft—she trims five feet by the stern. She

is about 3,070 tons builder's measurement, and 1,000 horse-power, double S. Her engines, by Maudslay, are compound; cylinders, four of 41, four of 75 by 36 inches stroke. They are absurdly cramped up in the bottom of the ship, and were extremely—from their design—expensive to make, costing £93,000, or half as much more than an ordinary engine of the same power. Her designed speed, as stated by Mr. Ward Hunt in the House of Commons, in apologising for her excessive cost, was 18 knots. Her bunker capacity, 500 tons. Now, *after* she is recognized as a failure, we are told her designed speed was 17½ knots, and coal power 750 tons. Her cost, per estimate, I make out in round numbers, £218,000! Her speed on the mile, at 16 inches short of her draft, was 16·4; on the six hours' trial 16. Coals per day, 205 tons. Viewing the draft, it is not too much to say that she is a good two knots short in her speed from the design. In the matter of "slimness" of structural strength, the Admiralty have produced their *chef-d'œuvre*. Her frames are four feet apart, the longitudinals four feet apart, the bulk of the plating is half-inch, or about the same as that of a rationally-built iron vessel of 500 tons, and her topsides are three-eighths. Mr. J. W. King speaks of this ship's scantling as being "extremely slight." ("War Ships of Europe," p. 122.) I have no hesitation in saying that she is a rattletrap. Her speed is less than the *Inconstant's*, though she is 1,000 tons smaller, the same nominal horse-power, and has all the advantage of 60 lbs. steam instead of 30 lbs., and the compound engine. I have assigned her a speed—blue water—of 13½ knots and five days' coal, or, with the larger amount, seven and-a-half days at, say, 13 knots. What is the use of this? It is not enough to go from Queenstown to New York. After trials extending over six months, the *Iris* has been got to go 18·6 knots on the measured mile. She was 17 inches short of her designed draught, which perhaps

makes a difference in the ship's favour of a knot to a knot and a half. The wear, however, on the brasses was so excessive, arising from the ship's slimness of build, that there is no prospect of anything like this speed being realized on blue water, nor is it likely the ship will be pressed to full speed at the load draft. It is just the story of the *Shah* over again; the ship is not staunch enough to carry the engines at full speed. The material of which the *Iris* is built is excellent; whether it is suitable is quite another question ; the workmanship also is excellent. The fault of the ship, I may again repeat, is, that there is not enough material used in her construction. Beyond recording the fact that the ship has gone 18·6 knots on the mile, I have made no alterations in Table V. If the reader would like to know something of a merchant high-speed steamer, the following are particulars of the *Munster*, built in 1860, by Laird, for a Holyhead mail-boat, and running yet, and likely to run for many years more. She is 327 feet by 35 feet by 13 feet draft; builder's measurement, 2,039 tons ; engines, paddle, Boulton & Watt, 750 horse-power. Cost of ship and engines complete, £90,000 ; or say £44 a-ton, against £70 a-ton of the *Iris*. The *Munster's* measured mile speed was 17·8 knots, or 20¾ miles, or a knot and-a-quarter more than the *Iris*. Between October 1st, 1860, and December 31st, 1866, she made, without breakdowns, 2,585 passages, averaging 3 hours 54 minutes, or rather over 14 knots, and this includes delay in fogs. She has common engines, and carried 25 lbs. steam. She burnt, at the 14-knot speed, 3½ tons an hour, or 84 tons a-day. Putting these ships together, what is the logical deduction of the skill of the Naval Constructive Department? Why this, that with seventeen years' later experience, and the compound engine, both in their favour, they give us a rattletrap, of less speed, which burns more coal, and at 60 per cent. greater cost.

Is it correct or not to say the Constructive Department know nothing about ships?

The *Osborne* yacht, which is said to be the fastest vessel in the navy—I bar torpedo boats—has not the speed of the Isle of Man steamer, *King Orry*, which is 1,058 tons, against the *Osborne's* 1,536 tons.

The *Comus* corvettes, building at Glasgow, are of the following dimensions:—224½ feet by 44½ feet by 17 feet 9 inches draft; tons, builder's measurement, 2,100; horse-power, 350. The frames and beams are of iron. The plating and the armour-deck is of steel; the bulk of the plating is five-sixteenths and single rivetted; the frames are spaced 42 inches. They are sheathed with two thicknesses of wood, and coppered, have lifting screws, brass ram bows—stern post of brass—after-stern post of wood. They are too light in the scantling, and no registry would class them. The armour-deck is made up of two thicknesses of ¾-inch steel; they also have auxiliary rudders, which are an utter fad, and have no foundation of usefulness; and this is the opinion of one of the highest authorities. Three of the engines are as follows:—

One of 46 inches and two of 64 inches by 33 inches; the other three are two of 36 inches and two of 64 inches by 30 inches; horse-power, 350. Speed on paper, say 13 knots; coal for this, at 2·4 per I.H.P. per hour—59 tons daily—they are to carry 270 tons of coal. Blue-water speed, say 11 knots, and nine days' coal. Cost estimated, £123,000. Their model is bad for speed, as they have too much beam for their length. These "very useful vessels" (Mr. W. H. Smith)—and we are threatened with the infliction of more—are designed to protect commerce. And the way they would do it, against a privateer of the fast mail steamer type, may pretty well be inferred by considering the following:—The *Corcovado*, built by Laird in 1871 for the Pacific Company, and now

sold to the Royal Mail Company, and running as the *Don*, is an admittedly fast ship. She is 375 feet by 43 feet, and at 23 feet draft will carry 900 tons of coal and 2,000 of cargo. Her blue-water speed is 13 knots, and for this burns 60 tons of coal. She cost £120,000. She is 3,805 tons gross. Her engines, by Laird, are 64 inches and 103 inches by 54 inches; 600 horse-power. Of her speed there is no more doubt than that the sun shines. In March, 1873, she went from Lisbon to Rio in twelve days, eighteen hours = 13·8 knots; and from Lisbon to Coronel, in Chili, in twenty-eight days, including stoppages. It will thus be seen that the *Corcovado's blue-water* speed is the same as the *Comus' paper* speed, and the relative coal power, five days to forty-eight days. If the reader wants to know why this huge difference, the answer is, in the first place, *fads;* and in the next, the *Corcovado* is a good model for speed; the *Comus* is merely a "chopping block."

As regards the application of this modern steel to ship-building, I desire to offer the following remarks: It is entirely in the trial stage, and the little experience we have had of it is unfavourable—viz., the torpedo boats—rusting very fast.

I have paid some attention to this subject, as it would be money in my pocket if I could build a steel ship. This steel is two and-a-half times the price of iron, it rusts sooner, and is more subject to galvanic action. Captain Aynsley's (R.N.) experiments clearly show this. He took much trouble to show me the results of his experiments at Spring Gardens, and I could not have received more courtesy and attention. There have been three steel vessels lately built, two by Elder, to run from Newhaven to Dieppe, and one by Laird, for the North Western Railway, to run from Holyhead to Dublin—the *Isabella*, 250 feet by 30 feet by 14¼ feet depth; B.M. 1,130 tons;

engines, paddle, by Laird; cylinders 64 inches, by 72 inches stroke; speed, 15 knots. The railway company made the steel at Crewe Works; I went to see it making. These three ships are all for service in tidal harbours, where a few inches draft is of great importance. I have been over the *Isabella*; her frames are spaced 22 inches, her garboard strake, $\frac{3}{4}$ of an inch, sheer strake, $\frac{1}{2}$ an inch, both double rivetted; remainder of plating, $\frac{5}{16}$ and $\frac{3}{8}$ of an inch. A good deal of plating in the midships is doubled. Compare this scantling with that of the *Comus*. Not one of our mail companies has either a steel vessel built or building, and as I have laid it down as axiomatic (see *Times*, June 12th, 1875) "that every invention for the improvement of either ship-building or navigation" is adopted by us long before the State takes it up, such as the change from wood to iron, paddle to screw, adjustment of the compass by fixed magnets, and the compound engine, the corollary is, that it would be quite time enough for the Admiralty to spend £435,000 on two steel vessels when our experience had shown it to be successful. In the *Iris*, drawing twenty-two feet aft, a few inches of draft can be of no rational importance.

Another small item about steel ship-building may not be without interest. Some months ago the Cunard Company had it under consideration whether they would build their new ship, *Gallia*, of steel. One of the partners went to Sheffield, and entered into the matter, and they had this further advantage, that their builders, J. & G. Thomson, are building the new *Iona* of steel, and one of the first houses in Sheffield offered to supply it at £12 a ton. The Cunard Company decided *not* to employ steel, and the *Gallia* is being built of iron. It may be supposed, without any violent effort of the imagination, that the company which have navigated the Atlantic without the loss of a life or a

letter for thirty-eight years, know something about their business.*

A great defect of the Constructive Department is, the amount they waste in patching up old ships. Nothing but the outcry of "Vigil," "Fact," and "Navigans," in the *Times*, of September, 1876, prevented £70,000 to £100,000 being spent in tinkering up the wooden ironclad, *Royal Alfred*. On February 15th, 1877, the Editor did me the honour of allowing me to point out the waste of spending £21,000 on a first estimate to repair the old wooden paddle yacht, *Enchantress*, though, I am sorry to say, without effect. I mentioned that a superior vessel of iron might be built for £30,000. The vessel I had in my mind's eye at the time was the Liverpool and Glasgow steamer, *Princess Royal*. She is fully described in Table VI. Her cost was £28,000. She has gone hence to Greenock at the rate of 14·6 knots, and I have made many passages in her, both in fine and bad weather. Her cabin is amidships, and Rothschild or Lord Westminster could not have a better yacht. The *Enchantress* is of similar size and power, viz., 876 tons, and 250 horse-power. She was launched in 1862, and her cost, *plus* 17 per cent. for charges, was £51,667.

In the Blue Books under examination, 1867–68 to 1875–76, that is, nine years, this ship is debited, for repairs and keeping up, with £28,917; to this add 38 per cent. for charges, and this makes £37,146. To this has to be added £21,000, and 38 per cent., and the sums spent from 1862 to 1867, so that there cannot have been less spent in repairs and keeping up than £75,000. I do not believe any one

* May, 1878. I have just seen in Greenock the steel bowsprit, 61 feet by 16 inches, of the celebrated cutter yacht, *Oimara*, snapped off as short as a piece of glass. It had only been in use a few days; it was moderate weather at the time, the yacht not even dipping it. The new one was made of Oregon pine. By a return dated 25th July, there are only two steel vessels being built to class at Lloyd's; there are 289 iron ones.

could be found to give £5,000 for the *Enchantress*, even were the whole Board of Admiralty going to jail.

Another grave fault of the Constructive Department is, that they put off far too much time in building their ships, and alter them while building. The *Shah* is an example of this. She was ordered on 21st January, 1870. Mr. Goschen, in moving the naval estimates in 1872, said they proposed to complete her within the financial year, that is, by April, 1873. After innumerable breakdowns and "accidents," she did not go to sea till December, 1876. Twelve months is the usual time to build a mail steamer of this size, and two years ought to be ample for a man-of-war, if rationally built. It follows that in this case the nation has had to lie out of its ship and its money for four years.

Supposing half the value of the ship to be £135,000, and interest at 4 per cent., the loss on this item alone amounts to £21,600. The pay of the officers, &c., attached to the ship all these four years would, of course, amount to a further large sum.

Here is an episode from the Dockyard Blue Book, vol. 44 of 1873, p. 153:—H.M.S. *Dryad*, 39 guns, 3,027 tons, 600 horse-power; machinery made by Napier in 1860–61; price not stated, say £34,000. The ship was ordered to be broken up in 1864, the engines were never moved out of Napier's yard, and were resold to them as old iron and brass for £3,500. The boilers were ultimately utilized for the *Topaze*. The loss to the nation cannot have been less than £20,000 on this transaction. I venture to say that had this story been told in one of Hannay's novels it would have been thought a burlesque, but "truth is sometimes stranger than fiction."

Our naval policy, as regards ship-building, appears to me to be going steadily backwards. Since the introduction of

iron into the navy, the cost of the ships has increased most ruinously, without any commensurate return.

The *Ariadne*, wood-built in 1859, was of the same size and power as the *Raleigh*, built in 1873; the cost of the former was £135,280, and of the latter, £193,386, both excharges. (Parliamentary Paper 297 of 1876.) The difference is entirely due to money spent on the hull, as the engines of the *Raleigh* cost less than those of the *Ariadne*. A shipowner building at the two dates would have found the prices pretty much the same—*i.e.*, a wood ship in 1859, and an iron ship in 1873. The difference in the cost of the frigates—say £61,000—is due entirely to fads. The consequence of this is, that we have now fewer ships than we had in 1867–68, whereas, as we spend more money, we ought to have more. In the 1867–68 Blue Book may be found in the active list fifty six ships of the class with which this work is occupied; in 1878 there are only thirty-nine. (See Table V.) No wonder, then, that there are no ships for reliefs. It is hardly necessary to point out how much more commerce we have to protect now than we had in 1867–68. And yet Mr. W. H. Smith, speaking at a public dinner in the city a few days ago, said "the navy never was in a better position!"

Of these before-mentioned fifty-six ships, one has been wrecked, and only six remain on the active list. I do not count the paddle frigate, *Valorous*, as her day is past. Every ship built by the Cunard Company since 1860, with the exception of the two wrecked, is at work, either for themselves or other people; and if these two facts, which are easily verified, do not open the eyes of the public to the way in which our State building is, and has been, conducted, then I feel that nothing more can or need be said.

Our merchant steamers have, during the last fifteen years, improved in speed, in carrying capacity, and coal endurance;

the Queen's ships have done nothing of the kind. The change is due, in our ships, to increased length; the "chopping block" theory, so dear to the Admiralty, is still steadily persevered with. The *Wolverine*, built in 1863, has better dimensions than the *Comus*, built in 1878, and they carry the same amount of coal. The *Comus* has the advantage of compound engines, but, viewing her inferior model, I do not expect her paper speed will be half a knot better, or her coal endurance one day more.

The coal endurance of frigates is a matter on which much might be said, and all of it of an unfavourable nature. One extract must suffice. (See Parliamentary paper 369 of 1877, in the account of the *Shah* v. *Huascar*.) The *Shah* was cruising, at most, eleven days, at the speed of ten, and on one occasion eleven, knots. She cannot have been under weigh more than nine days at the outside, during which she took in sixty-one tons of coal. After nine days' moderate steaming, the *Shah* begins to cry out for coal. "The *Shah's* coal supply getting short now began to be a serious consideration" (p. 13, par. 28). These are Admiral de Horsey's own words. The root of the evil is the "chopping-block" theory. A merchant-vessel for high speed has now a length of ten to eleven times her beam, a frigate six to seven times her beam. The Admiralty have in their wisdom decided that a long ship is unhandy, and this is the end of the matter.

The perversion of ingenuity which the Admiralty exercise to get hold of the wrong end of the stick is simply marvellous.

Does one ironclad sink another through the grossest tailoring, and the neglect of the most ordinary precautions of the seaman's art? Then do not make provision for your seamen to learn their business, but make the prows to ship and unship, obliging them to go into dock before they are ready to fight.

Does an iron ship foul more ready than a coppered one?

Then do not make provision to clean her, either by docking or heaving down, but copper your iron ship; thus, like the drunkard, taking an enemy into your stomach which will eat away your vitals!

Does a ship of 380 feet take more room to turn than one of 280 feet? Then do not try how, by build, by seamanship, or by steam steering gear, you can make her turn better, but build a "chopping-block!"

Another pet fad of the Admiralty is that a ship must have great beam, or she will not have a steady gun platform. They have only to make a voyage in one of the ships they condemn to show how illusory this theory is. I have carried myself in a vessel of 246 tons, boilers of nine tons on deck, and one of twelve tons planted on the kelsons and standing eleven feet above the deck. And in steamers of 1,000 tons it is quite common to take thirty or forty tons weight of thrashing-machines or railway-carriages on deck. So far as stability is concerned, these weights, had they been guns, might have been used in any weather in which the roughness of the sea would have given you a chance of hitting your opponent.

The extremely short life of the boilers in H.M. ships has at last forced itself into public notice, with the usual result of a Report and a Blue Book. Many of our new ships have required new boilers after serving one commission, say four years.

Mr. Smith, in speaking on the Navy estimates for 1878–9, said, in March, 1878, he was informed that the non-endurance of the Navy boilers was owing to their not being kept in constant work. It is very strange that it never occurred to naval men that the boilers of coasting steamers are not kept, in that sense, in constant work; but one thing is certain, and that is, if coasting steamers required new boilers every four years, there would be no coasting steamers, for they would not pay.

However, one grain of fact is worth a gallon of argument. The *Great Britain* steam-ship, working with a lifting screw, is precisely a case in point. In the Australian trade, when the ship would not go eight knots, we put down the screw, and took it up again, when she went eleven. On the tenth voyage, in 1862, I find, on referring to my log, that we had steam on and off, going out, twenty-three times in fifty-nine days, and coming home, twenty-four times in sixty-three days.

This ship, in her Australian voyages, was about half the time under steam. The engines put in in 1852 were by Penn, and a better job never came out of his workshop. She once steamed forty-seven days and-a-half, Falkland Islands to Liverpool, without stopping. The first boilers made three trips to New York, the Crimean war, one voyage to India for the mutiny, and eleven to Australia; they cannot have taken the ship less than 220,000 miles; they were taken out in 1863. The next set, made by Fawcett, have made eleven voyages round the world, and are quite fit to go another. They must have taken the ship 150,000 miles. Mr. King, in his work on "The War Ships of Europe," says (p. 223), "The average useful life of boilers in British commercial vessels is nine years."

This statement agrees entirely with my own experience. One would suppose that after forty years' experience it hardly required a Committee to tell you that boilers should last more than four years, and it is quite well known that the fault of the Admiralty boilers is this: they are too contracted, both in the steam and water space; for a Navy boiler to go without priming is the exception. The great anxiety of the Admiralty is to keep the boilers below the water-line. The position of the boilers being a few inches above or below the water-line may be a matter of some speculative importance; to me, now that line-of-battle-ships are ironclads, it

appears of much less importance than formerly; whether the engines will go or not, does appear to me a matter on which no speculation is admissible.

After we have built and paid for six of the crazy gems, it is admitted that they are a mistake as to the boilers being too small. I am extremely surprised that no independent M.P. asks for the logs, both ship and engine-room, of the *Tourmaline* (on her late voyage to the Cape) to be laid on the table.

The *Alabama* was a pretty successful example of a cruising vessel. Did the Admiralty take any lesson from her? Not the smallest.

The *Alabama* was 214 feet by 32 feet, and 15 feet draft, with 300 tons of coal and six months' stores; 300 horse-power; 1,044 tons; cost £47,500, or £45 a-ton. In scantling and build she was similar to a navy ship. (See "Semmes' Journal," Vol. II., appendix.) She sailed in July, 1862.

The four corvettes of the *Dryad* class were built in 1865–66, four years after the *Alabama;* they were 187 feet by 36 feet, and about 16 feet draft; 300 horse-power; 1,083 tons; average cost, £69,700, or £64 a-ton. The *Dryad* carried 225 tons of coal.

It is not difficult to see from these particulars that the *Alabama* was superior to the *Dryad* in model, in speed, in mobility, and in coal endurance; and, as to the matter of cost, you might have three *Alabamas* for two *Dryads*, and this without troubling the "model department of the world," but by simply taking your order to a private builder, named Laird, of Birkenhead.

My clear opinion of the Constructive Department is, that it is not only a disgrace, but also a great danger to the country. There is not the least hope of the department reforming themselves. The spectacle of Mr. Barnaby going to

a meeting of the naval architects, and urging our "gradually producing a closer approximation in the mercantile steamships to the ships of war," shows, at any rate, that they have a perfectly good opinion of themselves. Mr. Barnaby might as well ask for the moon. (See *Times*, March 24th, 1877.)

The best remedy I see for this state of things is, that Parliament should insist on the First Lord's taking help from the outside.

Here are four men whom I recommend him to invite as members of his Constructive Board, before he begins any new ships:—E. J. Harland, shipbuilder, Belfast; Alfred Holt, civil engineer and steamship owner, Liverpool; J. F. Light, principal surveyor, Lloyd's registry, Liverpool; William Pearce, shipbuilder, partner of John Elder & Co., Glasgow.

I have the honour of the acquaintance of the latter three; Mr. Harland I only know by his work. He is not a child of fortune, but owes his position to his own brains and his own industry. He is the builder of the White Star steamers, and was the first man to build long vessels that did not require to be strengthened afterwards. I am old enough to remember the *Istrian*, 390 feet by 37 feet, and 2,930 tons, built by him in 1867, for Bibby, the parent of long ships. I have a considerable acquaintance among shipbuilders, and if there is such a thing as the best ship or the best builder, I believe the builders themselves would hand over the belt to Harland, of Belfast.

Of Mr. Holt it is only necessary to say that by his brother shipowners, and by marine engineers, he is considered one of the ablest men in Britain. He is no mere theoretical man; he may frequently be seen, with an engine-room lamp in his hand, going through his boilers for himself. If an engine stops at sea, Mr. Holt is just the man who can go to work and set it going again. He has the honour—and it is a high honour—of being the first man who made a

long-voyage full-powered steamer pay, without a subsidy, *i.e.*, the line to China, *via* the Cape.

Mr. Light is a principal surveyor to Lloyd's, and a man of the longest and most varied experience, and served his time to wooden shipbuilding. The knowledge such men possess, from the great number of ships passing through their hands, as to the places they are first likely to go, and, above all, on questions of structural strength, could not fail to be of advantage to any managers of shipping. There is no doubt that Lloyd's registry commands the confidence of the respectable part of the shipping community. "At the present moment nine-tenths of the merchant ships building in the country are being built in accordance with the society's rules, and have been placed voluntarily under the inspection of its surveyors." (See letter of Bernard Waymouth, *Times*, 23rd March, 1877.)

Mr. William Pearce is a partner in Elder's. He has been a foreman in Chatham dockyard at the building of our first ironclads, a surveyor to Lloyd's registry, and a manager in Napier's. It is hardly necessary to point out that a man who has risen to a partnership in the largest ship-building firm in the world, without the adventitious aid of fortune, must be a man of something more than average merit and ability. His evidence in Lord Dufferin's Blue Book is one of the most valuable parts of that most extremely valuable book.

A First Lord, with such men on his ship-building committee, would immensely strengthen his hands, and satisfy the outside public. With the best men in the country at his back, if he did not spend his money to the best advantage, and avoid the waste and folly and blunders of his predecessors, it is quite clear he would have no one to blame but himself.

The ships to protect commerce, of which our Navy are woefully deficient, are the ones which should be built. I suggest as follows:—The first class, similar to our fast mail steamers of the *Medway* and *Corcovado* type, say of not exceeding 4,000 tons and 600 horse-power. The top speed of this type to be 15 knots on 85 tons of coal, and a cruising speed of 10 knots on 25 tons of coal. Coal power, 1,000 tons.

In the case of the *Medway* you would still have 1,900 tons of weight in hand, and all the 'tween decks for crew, or troops.

A belting of 4-inch armour, with 12-inch teak backing, might be put round the boilers and engine space, 10 feet deep, for an additional weight of 300 tons, and at a cost, reckoning £40 a-ton for the plates and £3,000 for the labour, of about £12,000. I am informed by the highest authority that there would be no difficulty in putting a 9-inch belt, and a 2-inch horizontal deck over the machinery, in such a vessel; but I have not gone into the cost. In the latter case you would still have 880 tons dead weight in hand.

With a 4-inch belting, the advantages such a ship would possess over the *Shah* or *Inconstant* are that her vitals are protected from any privateer you are likely to meet, 1½ knots greater speed, and could carry 2,600 tons of coal, against 600 tons, and at *half the cost.* Such a ship can now be built for £125,000. Of the smaller class, I would take the *Kent* as a type. Say 2,300 tons, and 300 horse-power; top speed, 11 knots, with 900 tons of coal; cruising speed, 9 knots; 32 tons a-day for the former, 15 tons for the latter, or 27 days and 60 days, leaving 950 tons dead weight in hand, and the 'tween decks clear. Athwart ship, bulkheads 10 feet deep might be had (4-inch iron, 12-inch teak) for an additional weight of 85 tons, and a further cost of £3,240. The labour in this case I take at £640; the teak, in both cases,

at 5s. a cubic foot. I do not wish to speak didactically as to the cost of the armour plates, or labour; the Admiralty can tell this, for it is no part of my programme to abolish the Constructive Department, but to strengthen it. Allowing the 4-inch bulkheads to be equal to the *Comus*' 1½-inch deck, the comparative merits of the *Kent* and *Comus* are, the *Kent* is a better model, is equally as fast under steam, far faster under sail, burns about the same coal, but could carry, allowing for the margin of cargo, 1,765 tons of coal, against the *Comus*' 270 tons. In the matter of cost, you could have two bulkheaded *Kents* for one *Comus*.

The *Medway* and *Kent* will do thirty years' work; they may want new boilers every ten years, which, for the larger ship, could be had for £8,000. I should be very pleased to think the *Comus* capable of doing twelve years' work. To keep up the hulls of the merchant ships is simply a matter of cleaning and paint; to keep up the hull of the *Comus* may be anything between £2,000 and £5,000 a-year. To dock and paint with composition a ship's bottom, such as the *Kent*, costs in Liverpool £110. Twice a year is ample. £110 includes the painters, the graving-dock rates, and the riggers and carpenters moving the ship, and shoring and unshoring.

I have stated, in the chapter on Naval Education, my opinion as to the relative merits of going to a building-yard and listening to lectures at Greenwich. Had a young officer been in the habit of going to Elder's yard—and there is nowhere he would receive more attention—there is one fact he might note, that the keels of the *Medway* and *Comus* were laid at the same time; the *Medway* has just returned, two days before time, from her *second voyage* to the West Indies, a few days after the *Comus* was *launched*.

It is useless to say that our ships are built too hurriedly; the truth is, the absence of fads; the *Medway* is twice the

size of the *Comus*, and of less cost. She is the fourth ship built by Elder for the Mail Company.

The *Kent* is a lifting screw-ship the Admiralty might well make a note of. Her builder, Clifford Wigram, is one of the most competent men in Britain, and this ship represents the result of his experience in building and sailing four of a similar kind. Depend upon it, there is plenty in this ship worth studying. I am old enough to remember the old *Kent*, of about 1,000 tons, which in her day, now some twenty-five years ago, was a very crack ship, and used to run against the *Marco Polo*.

The master of the *Kent*, George Gibbs, an old schoolmate at the Royal Academy, on his return from his first voyage, wrote me as follows—the letter is before me :—"We were 51d. 2h. to Cape Otway outwards. I had never had a fair day's run ; the best was 293 knots. Homewards, round the Horn, 58d. 3h., including 27 hours in St. Vincent. The ship is perfect in every respect. Perhaps I am speaking rather strongly when I say this, but I found nothing during the voyage (round the world) that I could wish altered. The engines worked admirably." This is rather different to the *Tourmaline's* voyage to the Cape. The *Kent* has just returned from her third voyage, homewards *viâ* canal, 49 days dock to dock, and goes out again next month (May). She sailed from Plymouth on her first voyage, 25th October, 1876. There is not in the whole Navy List one cruiser that is fit to be named in the same day as the *Kent*.

P.S.—May, 1878. Gibbs tells me, on his last voyage he went out in 45 days, and sailed, in a good day's run, 347 knots.

2nd Edition.

Mr. W. H. Smith, in his speech to the House of Commons, August 8th, 1878, stated the results, as far as the Navy was concerned, of the four months which had elapsed

since he made his statement in March. He had bought four ironclads and two merchant steamers, and one of the latter, the *Hecla* (late *British Empire*), he was going to try if he could make of use as a vessel of war.

I may state at once that I think the purchase of the *Hecla* a very wise step, and one for which Mr. Smith deserves great credit.

The Admiralty can thus see for themselves what a first-class merchant steamer really is; they certainly will not find her plating only half-inch, and her frames spaced 42 inches.

As regards the steps taken to protect our commerce against Russian privateers, it appears to me they were not effectual. The *Cimbria*, which is now stated to be a Russian vessel, was at anchor in Maine, U.S., and the only vessel available to look after her was the *Sirius*, a wooden corvette. It would be as much use sending the *Sirius* after the *Cimbria* as a cow after a greyhound. Mr. Smith also stated that he had looked out thirty of our fast mail steamers, which he could have armed and sent to sea within three weeks. I desire to point out that in the event of war the *Cimbria*, long before three weeks had elapsed, would have been across the Equator, destroying every British ship in her track. Two ounces of dynamite and ten minutes of time are sufficient to destroy any merchant ship.

It appears to me that the course to have adopted would have been to charter two mail steamers of superior speed and coal endurance to the *Cimbria*, protect their engine space either with coal or armour, put men-of-war crews and guns on board of them, anchor them alongside the *Cimbria*, with orders never to lose sight of her, and, in the event of war being declared, go at her at once. Mr. Smith appears to be so far satisfied with the number and condition of the

unarmoured ships that he only proposes to lay down two more—one of the *Boadicea* class at Portsmouth, and one of the *Comus* class at Chatham. This, I think, entirely unsatisfactory. Counting the *Hecla*, we have forty ships and seven building fit to protect commerce; twenty-three of these are wooden ships, and are not of the least use to chase steamers.

A further return, showing the cost of repairs of these wooden vessels, and for which we have to thank Mr. Brassey, is here appended. It certainly baffles all criticism. (No. 312, of 1878.) From it I have selected six ships that have only served one commission :—

	Has Served		REQUIRES	Estimate, or Rough estimate of Cost.
	Yrs.	Mths.		
AMETHYST ...	4	11	Thorough repair and new boilers	£22,870
BRITON	4	5	Repairs and new boilers	24,239
DIDO	5	2	Thorough repair and new boilers	20.500
DRUID	4	10	Repairs and new boilers	28,196
ENCOUNTER...	4	4	Repairs and new boilers	30,000
THETIS	4	4	Overhauled	30,340

This estimate of cost does not include charges, which are 38 per cent. additional (see Table IV). The present price of first-rate iron steamers of the size of these vessels, and eleven knot speed, is £19-£20 a-ton. So that if our money was properly spent we might have new iron vessels for what we are spending to repair these wooden ones, which have only served one commission. A later paragraph of Naval intelligence (*Times*, September 26th, 1878) points out that the *Dido* is being almost rebuilt, and that the cost is about £30,000.

In the same Parliamentary paper (312, of 1878), £15,598 is the estimate (ex charges, of course) to repair and fit out the old *Juno* frigate, built in 1844, as a training ship. She is now called *Atalanta.*

It is only necessary to say that a new iron vessel of the China clipper model, and of the same size, could be built for less money.

Whether anything will come of this return I know not; waste and recklessness could no further go.

THE LOSS OF THE *EURYDICE.*

I purposely refrained from any comments on this event whilst the matter was *sub judice,* and the court-martial had not given their report.

The broad outline of the case is as follows:—H.M. frigate capsizes in a squall, and drowns 330 men. A collier schooner of 137 tons and six hands is caught in the same squall, and not only suffers no damage, but picks up the two survivors of the catastrophe. "No blame is attributable to any one."

There are, of course, in the seaman's calling, occasional blows to be encountered against which his art and watchfulness are alike powerless; such, for instance, as the breaking adrift of all the ships in Calcutta in the hurricane of 1864, when no man could show his face on deck to do anything for fear of falling spars, but the squall which struck the *Eurydice* cannot be considered as one of them.

The *Eurydice* was built at Portsmouth. Launched 16th May, 1843. Length, B.P., 141·2 × 38·10, and mean draft 16·6; tons, B.M., 908. She carried 30 tons of permanent ballast. Her spread of canvas was proportionately greater than any ship in the navy, being 13·9 square feet of plain sail for every ton of displacement. (Lord Dufferin's Blue Book, p. 342.) This amount of sail area is proportionately greater than that carried by the China tea clippers, which

were the largest sail carriers among merchant ships. (*Vide* the comparison of the *Pique* frigate and *Thermopylæ* tea clipper, in White's "Manual of Naval Architecture," p. 503.) This class of vessel seems to have been unfortunate, as may be gathered from the following extract from a newspaper usually well informed on naval matters:—

"The *Western Morning News* says an opinion prevails among naval men that the loss of the *Eurydice* was due to the peculiarity of her construction, taken in connection with the exhaustion of water from her water-tanks. In all vessels designed as the *Eurydice* was by the late Admiral Symonds, the water-tanks were so placed as to form an essential part of her ballast. This water would be greatly reduced in quantity during her cruise. If this were not made good by refilling the tanks with salt water as they became emptied of fresh water, the stability of the ship would be materially affected. The brigs *Racer* and *Star*, built on the same plan as the *Eurydice*, both capsized, the former with loss of life; and the brig *Sappho*, also one of the Symonds' build, sailed from the Cape for New Zealand, and was never afterwards heard of. The reduction of the number of the *Eurydice's* guns from twenty-six to four would further render her less stiff; not so much because of the removal of the guns, which would be on the main and upper decks, but because of the absence of the proportionate quantity of shot and shell which would be carried below and act as ballast."

The seaman, Cuddiford, states (*Times*, Aug. 28th) that the *Eurydice's* tanks, when empty, were never filled with salt water, and the stability of the ship was still further compromised by her carrying 117 tons of drinking water, instead of 90. Carrying nine boats instead of seven, being more top weight, would also tend to instability. Another curious thing about this ship is that her centre of gravity was stated by Mr. Robinson, the master shipwright at Portsmouth (*Times*, 30th Aug.)

to be 2′.4″ *above* the water-line. I gather from Lord Dufferin's Blue Book that this is unusual in a man-of-war; in a merchant ship it may be stated that it is *always* below the water-line. I certainly was very much surprised to read of the position of the centre of gravity in the *Eurydice;* and I wrote to three of the largest and most celebrated shipbuilders, to enquire as to the position of the centre of gravity in merchant ships. The answer is the same from each; they had never known a merchant ship in seagoing trim with the centre of gravity above the water-line. *Cæteris paribus*, the higher the centre of gravity the more unstable the ship. Men-of-war depend on their great beam for their stability. The *Eurydice* had about two feet more beam than one of the old Indiamen of similar tonnage. Mr. Robinson's evidence further seems to show that the weight of the armament was reduced from 213 tons in 1854, to 109 tons in 1877, but no particulars as to the relative weights of guns and shot, or the stowage, was given. Let us see what steps were taken to insure the ship's stability. Admiral McClintock, the superintendent of the dockyard when the ship was fitted out, was asked as to this (*Times*, Aug. 30th), and his reply was as follows:—"The question of stability is dealt with by the Controller's office. When a ship is nearly ready for sea, her stability is usually tested by an officer sent down from the Controller's office." In the *Times* of May 16th, 1877, p. 10, is the following:—"When the *Eurydice*, the new training ship, Capt. Hare, was built, the inclining and rolling of ships were experiments unheard of among naval architects. As, however, the frigate has undergone a thorough transformation at Cowes and Portsmouth, she underwent the ordeal of inclining on Friday, previous to her forthcoming cruise with ordinary seamen. The operation was conducted by Mr. Allington, of the Controller's department, and the stability was found to be all that could be desired." This is perfectly clear; now what does Mr. Barnaby, the chief constructor of

the Navy say as to this. (*Times*, Aug. 31st.) "She was inclined under my direction, on 11th May, 1877, *not for the purpose of discovering if she was a stable ship, but as a matter of scientific interest.*" The italics are mine. Mr. Barnaby further adds, "We rigged her in the same manner as before, put in her the same permanent ballast, reduced her armament, and brought her down to the same draft by increased provisions and stores . . . . it was seen that the changes which were made could not reduce the stability of the ship . . . . "—in brief, that the Controller's department took for granted the stability of the ship. The data upon which the Controller's office founded their conclusions were, in the words of Mr. Robinson, the master shipwright at Portsmouth, "imperfect" (*Times*, Sept. 2nd), as "148 tons, or thereabouts, is the difference (of weight carried) between the reports of 1854 and 1877, though the drafts of water are alike." If Mr. Robinson had used the word "useless" instead of "imperfect," he would have been nearer the mark.

Mr. Barnaby also stated that merchant ships are not inclined to test their stability, and this is true; but Mr. Barnaby did *not* state the amount of ballast merchant ships carry.

The following refers to the tea clippers, the largest sail carriers we had in the mercantile marine:—

Sir Lancelot, 197·6 × 33·7 × 19 draft, 400 tons of ballast and 670 tons weight of tea. 886 tons register.

Spindrift, 219·4 × 35·6 × 18 draft, 240 tons of ballast and 675 tons weight of tea. 899 tons register.

Black Prince, 185· × 32· × 16·9 draft. 400 tons of ballast and 523 tons weight of tea. 750 tons register.

I do not attach much importance to the fact of some of the upper halves of the main deck ports being open; had the ship been sufficiently ballasted, she would have come upright again after the first burst of the squall was over, more par-

ticularly as she gathered more way from the helm being put up. It was not uncommon in the Indiamen, twenty-five years ago, for us to get a sea through the ports big enough to set chests afloat, but I never heard of it endangering the ship.

Nor do I think the statement that the *Eurydice* was carrying too much sail worthy of attention. The amount of sail you can carry with safety with a trained crew of 300, and what you could do with a miscellaneous collection of 30 to 35, which is the number the tea clippers carried in their racing days, are two widely different quantities. The ship went right over on her beam ends at once, and the crew were like flies on a pane of glass—quite helpless.

As a court of enquiry the court-martial was a simple farce and a sham. It was conducted entirely by naval men who had every possible interest to hush matters up. The court of enquiry on the loss of the *Megæra*, under the chairmanship of Lord Lawrence, was conducted in rather a different fashion, and the verdict on that enquiry commended itself to the knowledge and good sense of the nautical public. The court-martial on the *Eurydice* did nothing of the kind. Is it not in the last degree childish, a member of a court-martial asking the chief constructor and master shipwright if the ship was not stable and in good condition? What possible answer could be given by these officials but one, without convicting themselves? As a Liverpool paper points out (*Daily Post*, Sept. 4th, 1878), "there are five clauses in the judgment, and every one of them acquits somebody and something." "*Qui s'excuse s'accuse.*"

The verdict of the outside public in this case is "capsized for want of ballast;" though whether the Admiralty are able to realize it, and to profit by the blunder, is quite another question. Mr. Seeley or Mr. Brassey might ask what ballast they intend putting in the *Atalanta*.

As to Captain Hare, his officers and crew, though our regrets will not bring them back, nor repair the shattered homes, the fact that they have given their lives for their country and died at their posts is their best monument in our hearts and sympathies.

NAVAL EDUCATION.

CHAPTER IV.

THE increase of steamers has, of course, contributed, both in the Royal and Mercantile Marine, to the decay of seamanship. Some go so far as to say that it is rapidly becoming one of the lost arts.

This affects the Navy more than our ships, because a man-of-war proper must be a steamer; in the mercantile marine there are still many more ships than steamers. In Liverpool, the Local Marine Board will not let a man go up for examination if he has served all his time in a steamer; and quite right.

The glimpses we get from time to time of the "accidents" (so called) in the Navy, show us plainly enough that there is much room for improvement. I allude to the sinking of the *Vanguard*, the collision of the *Monarch* with the *Halden*, and the court-martial on the *Tenedos*. The best seamen among naval officers served their time in sailing ships, but the rising generation have now no chance of doing so. We have no sea-going sailing training ship for our young officers, and are about the only nation of importance that has not.

The Germans, Italians, Spaniards, and even the Japanese are before us in this respect. There have been some attempts at it, but they have fallen still-born. When the old *Britannia*, Admiral Dundas' flagship, was moored off Haslar Creek some twenty years ago, an order came down for one. The *Eurydice*

was brought down the harbour, moored alongside the *Britannia*, and the cadets were to rig her out themselves, and take her to sea. A wiser or more seaman-like plan never was made. Think of the knowledge which the boys would have gained; they might have taken their own boats, gone up to the dockyard, got out their spars, rafted them down, and also their rigging and sails, and fitted the ship out entirely with their own hands. The advantages and practical knowledge to be gained by this way of going to work, over the ordinary way of learning seamanship, viz., out of books —I mean the relative merits of the two plans—appear to me as far apart "as Heaven from Vauxhall." Alas, the *Eurydice* was sent up the harbour again, a fresh order having come down, knocking the thing on the head; the ship laid quietly for eighteen years, till, in 1877, she was fitted out as a training ship for ordinary seamen. Our officers are not wanting in mere book or theoretical knowledge, or in social accomplishments; what I have to point out is, that "the all-important practical training in the active duties of their profession" is lost sight of, and not properly carried out. There have been steam frigates devoted to this purpose; the last, the *Ariadne*, was paid off in 1873, and there having been several detached squadrons, the last was paid off in May, 1877; and this, of course, is better than keeping the youths in ironclads or in harbour; but I entirely agree with Admiral Rous as to the necessity of a sailing ship. "You can no more rear a seaman in a steamer than on the Bridgewater Canal."

The establishment of the *Britannia*, and the Naval College at Greenwich, were measures conceived with the best intentions, and no one can say a word, but of praise, as to such men as Hirst and Kalley-Miller, but the net result of them appears to me to be this, that you "cram" youths with knowledge that they do not want, or which would be

much better learnt elsewhere, and at infinitely less cost, and relegate their practical training to a secondary place.

Take the *Britannia*. There are in this ship some one hundred and sixty boys, the cream of our middle-class, taken from the best schools in the country at the age of thirteen, who are forthwith boxed up at Dartmouth for the next two years. By so doing you instil into them the notion that they are the salt of the earth; whereas, had they been left in the large schools till fifteen, where they would have had to rub shoulders with others, both older and younger than themselves, and then sent them direct to sea, they would have been in no danger of this kind. Then look at the expense of the *Britannia*. She cost (Parliamentary Paper, No. 295 of 1876) £185,210. By another return (No. 303 of 1875), to fit her up, cost £17,400, and her annual maintenance, that is, the pay and food of the officers and instructors, is £12,983. In the Navy accounts (Blue Book, No. 181 of 1876), there appear to have been spent on the ships *Britannia*, *Hindostan*, and *Dapper*, in the year 1874–75, £2,995. In addition to this, the parents of the boys have to pay for each £70 yearly. Adding charges, as per Table IV., and allowing interest of money at 4 per cent., a little simple arithmetic will show the cost of this ship yearly to be £37,794, and this divided by one hundred and sixty, the number of boys, gives £236. I have put the value of the *Hindostan* at £10 a-ton. If this mode of reckoning be objected to, I have only to say that no schoolmasters, public or private, can get their premises for nothing, and the calculation to show the relative cost of State and private teaching would be utterly worthless without taking these items into account. At the Royal Academy, Gosport, twenty-five years ago, it used to cost £90 a-year, and I do not think it costs more than £110 now. I know some of the *Britannia* cadets, and something of their course of studies, and I am quite clear

that if one of my sons was going to sea, I would send him to the Royal Academy rather than to the *Britannia*, even were the expense the same.

The advantages of Gosport, from its proximity to Portsmouth dockyard, the movements of the shipping constantly going on, the Queen passing through, in a word, the life of a large harbour, are vastly in its favour. Take, for instance, one of the most important points—instruction in steam. In my time, our instructor, Mr. T. Brown, chief engineer, R.N., would come on a Thursday evening, give us a lecture with the aid of a black-board, drawings to copy—I remember quite well a beautiful one of poor Goodenough's, then a mate studying at the college—and describe a particular kind of engine, say one of Penn's trunks, then coming into fashion, and wind up by saying, "When you come over to the dockyard on Saturday, I will show you this engine on board the *Arrogant* or *Encounter*." The same way with the indicator. This cannot be done at Dartmouth, and it is needless for me to point out the value of this method of teaching. I understand our excellent teacher is now living in retirement on a well-earned pension. It may afford him pleasure to hear that his admirable book, "Marine Steam Engine," of which he and Mr. T. Main are joint authors, is much read and appreciated in the mercantile marine. My much-battered copy, endorsed by Mr. Burney, Watt Sr., Feb. 8th, 1853, is now before me. It is popularly supposed that the cadets are taught seamanship in the steam gun-boat *Dapper*, and two or three cadets, some years since, explained to me the process in detail. I feel I cannot, without profanity, offer any opinion on this teaching, and happily it is not needed, for I have been since informed that the *Dapper* is rotten, and unfit to go out of harbour, her place having been taken by a *steam launch*. It is no duty of the State to enter into competition with the schoolmasters to teach boys arithmetic;

to teach the boys seamanship does appear to me a very serious duty of the State, and one, moreover, very much neglected.

A few words on the College at Greenwich.

They sit at the extremely moderate rent of £100 a-year. The gas bill is £1,600 a-year (Estimates, 1877–78). I can point out a pretty large hotel, making up seventy beds, with large public, commercial, and stock rooms, and where the gas is continually alight in the basement; the gas bill is £120 a-year. There are, according to the Navy List of July, 1877, sixty-nine officers studying there, and there are thirty-two teachers and professors; *inter alia*, two to teach fortification. I wonder if Dundonald ever attended such lectures, and, if not, whether he would have defended the Castle of Rosas any better if he had. German is the last language for a sailor to select; the Germans have no colonies, and all German captains are obliged to know English. French or Spanish one can understand, but what French or Spanish can a youth learn in England that will be of use to him as a sailor? I have known scores that have attempted it, and never knew one to succeed. Considering the number of pupils, one-half of the staff appear to be sinecures; there are an admiral and a captain, who receive £2,085 yearly, in addition to their half-pay. There are fourteen teachers for navigation and mathematics, three to teach steam, and two ship-building. In the mathematical class at Edinburgh University, fifteen years ago, there were some two hundred young men; Professor Kelland and two tutors taught them. It was considered the hardest worked class at the College; there was no admiral and no captain; the order was perfect. The fee was three guineas. The chemistry class, taught by Dr. Playfair, with one assistant and two tutors, was even larger. The order was also perfect. The fee was four guineas. Any student knew well enough that had he raised a row, the

Professor would have had him bundled out of the class-room. A youth that had been five or six years at sea would require a tutor's assistance. I find, on referring, I paid mine, for five months, £19. He was a youth studying for a schoolmaster, was an excellent tutor, and carried off the gold medal.

I have before me the examination papers for the rank of Lieutenant, R.N., of May, 1877. There is a paper on winds and currents. It is of course not difficult for a boy of fifteen to cram up such knowledge; but is the best way to attain it, studying in the college, or to keep, as you go along, a proper log-book, with the help of tested instruments and of such books as "Maury's Physical Geography of the Sea," and the works of Scott and Toynbee, of the Meteorological Office? There are two gentlemen to teach ship-building. The ship-building of the Navy, as it is one of the chief objects of this work to show, appears, in brief unofficial language, to be this—how to spend two shillings instead of one; and this quite apart from the question of building rattletraps. This knowledge hardly appears to be worth £347 a-year, *plus* a further sum as the instructor's normal pay. Scientific ship-building appears to be of a somewhat unsatisfactory character. No doubt the Admiralty could produce a perfect Sahara of figures to show that the *Captain* should not have capsized; that the *Inconstant* should not have suffered from galvanic action; that the bottom of the *Megæra* should not have dropped out from the same cause; that the *Vanguard* should not have required 360 tons of ballast in her double bottom (see Parliamentary Paper, No. 250 of 1875), for, had not that eminently scientific man, the Editor of "Naval Science," built her with frames four feet apart, and a "tea-kettle bottom of half-inch" (Admiral Chamberlain); that the *Iris* ought to have gone one-and-a-half knots faster; and, as a crowning mercy, in the case of the *Inflexible*, on which we have already spent some half-a-million, one set of scientific men say

she is seaworthy, while another set, with equal vehemence, asseverate she is not. Naval officers may learn more about ship-building that would be of use to them, in visiting both the private and public building-yards, and in service afloat, than they can in listening to a R.N. Constructor at Greenwich. If the Constructor knows his business, and does his duty, he must tell the youths that the Admiralty are throwing away the public money. It is obvious he cannot do this, so the teaching must be mainly a sham.

The following is from the pen of a distinguished French officer of high rank, whose papers on Naval subjects are always read with the respect and attention they merit. In speaking of the Naval Colleges at Greenwich and Cronstadt, he says:—"Whatever may be the authority of these examples, we should not adopt this new institution without examination. What before all is wanted for the successful employment of these new arms, the ram and the torpedo? It is a stout heart, an eagle eye, and a steady hand. Science can do nothing to develop these natural gifts; whilst practice, if it does not give, will always develop and strengthen them. The level of theoretical instruction is quite high enough among our officers; the instruction of the school is sufficient." (Translated from "La Défense des Frontières Maritimes," par M. le Vice-Amiral V. Touchard, p. 26, note.)

The cost of the Naval College for the year 1877–78, per estimates, is £36,377; this divided by 69, the number of students, gives the cost of £527 each for nine months' study. Assuming the Sub-Lieutenant's pay is £90 a-year, and that it costs him £2 a-week to live the odd thirteen weeks, then the cost to the country is at least £644 per head each. A young man may study at Edinburgh College for the winter, and study a foreign language on the Continent in the summer, for less than the half of £644. *Credo experto.* So far as I can judge, a youth who has had the advantage of sailing

in a ship with a Naval Instructor might, in one session, or, if he has not had that advantage, as in the case of a merchant officer, might, in two sessions at Edinburgh, acquire a perfectly competent knowledge of mathematics for any sea-going purpose. There are other subjects he might take up, such as chemistry and natural history, but not more than one each session, and these only as *délassements*. Mathematics, and in this I include what is called at Edinburgh natural philosophy, must always be the staple article of the bill of fare. No one can learn much of chemistry or natural history without devoting a life-time to it; but by working at it two hours a-day, one may pick up something, if it is only the boundless nature of man's ignorance. I am sorry to say that Dr. Allman no longer fills the natural history chair; but, having been fortunate to retain his friendship, I am reconciled to the loss.

An old schoolmate, now an officer of rank in the Navy, has been kind enough to point out to me, that there are more officers studying at the college, and that the Navy List of July, 1877, quoted by me, contains only the sub-lieutenants. My friend gives the number as two hundred and seventy-seven, which includes a number of private and foreign pupils studying naval architecture. He informs me that the sub-lieutenants are not taught shipbuilding; and that the fortification professors are for the benefit of the marine artillery, gunnery lieutenants, and marines; and further, a large number of the officers at the college are half-pay ones, and if not at the college would probably be idle.

The further remarks I have to make on the college are based on the Navy List of April, 1878. By this list there are at the college four captains, three commanders, fifty-four lieutenants, sixty-seven sub-lieutenants, thirty-one engineers, eight naval architects, one chaplain, one naval instructor, and thirteen officers of the marine artillery and marines. Total,

one hundred and eighty-two. Of course, if you divide £36,377 by 182, the quotient will be less than if you divide by 69. I am not questioning the principles of simple arithmetic; what I am endeavouring to show is, that the Chinese method of education is a mistake, and that if the money spent on the Navy was spent rationally, we might have twice as many unarmoured ships, and there would be no need for officers kicking their heels for long spells on half-pay at all. Nobody doubts that if the choice is to lie between idleness and study at the college, it is better to study. The policy of recklessness and waste so steadily pursued these many years in our shipbuilding, has naturally landed us in the position of having no ships to put our officers in; the paucity of ships is of course the great reason of the stagnation of promotion, which, by the verdict of the officers themselves, never was in a worse position. For the sixty-one senior officers studying gunnery, torpedoes, &c., I may point out there are already four ships, measuring together over 9,000 tons, devoted to these purposes, and that if accommodation cannot be found for sixty-one men in 9,000 tons of shipping, without establishing a college, then the management must be remarkable. There is a show of reason in sending sixty-seven sub-lieutenants to a college, but none whatever in spending £600 yearly per head to do so, when, if my views are correct, it might be better done for less than the half, elsewhere. As regards the few young officers of marines and marine artillery, are there not abundance of engineering and fortification lectures at the academy at Woolwich and at Chatham? To teach the theoretical principles of naval architecture to a very limited number of State pupils there can be no objection; the teacher of this subject, Mr. W. H. White, has written a good book, which I have had occasion to use, but there is abundant space for this in the mould lofts of the various dockyards; and if private pupils

want to hear Mr. White's lectures, by all means let them do so, but not to the burden of the public purse. My friend also points out that the police are kept up almost entirely for the public, who visit Greenwich in large numbers. I am very glad of it; it will be a sorrowful day for Britain when her sons and daughters do not take an interest in her ships.

Finally, as to the engineers. I have before expressed my opinion that the *Marlborough* is a mistake, and I see no reason to alter it. Nor do I see any reason for sending thirty-one engineers to the college. Suppose a ship-owner wants a first-rate marine engineer, how does he set about looking for him? Why, he takes a man who has served his time in a first-rate shop, such as Maudslay's, or Penn's, or Napier's, or Elder's, and then finds out what sea experience he has had. Does any mortal suppose that the facilities a young man has of learning his business in such shops as these, are not greater than those of the *Marlborough*, and the repairing shop at Portsmouth Dockyard? If not, then I can only say, the Lord help him!

Talking of examinations, I heard Mr. D. Maciver, M.P., state at a public meeting in Liverpool, April 25th, 1878, that when he was actively connected with the management of the Cunard Company, he had heard their superintendent engineer say "that he was not at all certain he had sufficient book knowledge to pass the Board of Trade examination." Is the marine engineering of the Navy as well conducted, as well looked after, and as free from accident as the Cunard Company? Certainly not.

So much for scientific teaching. What are we doing towards the practical teaching? According to the July, 1877, Navy List, we have 275 lieutenants, 228 mids, and 185 cadets. Of the first, 47 are at Greenwich, and of the cadets, 162 are in the *Britannia*, and this leaves available for sea-going, 179 young officers. I have also gone over the

list of vessels in commission, and noted how many of these young men were in stationary and armour-clad vessels, and was surprised and horrified to find one-third, or, more exactly, 156 so employed. This is sowing the wind with a vengeance, and the way we reap the whirlwind may be seen in the *Vanguard* Blue Book, questions 853, 854, 861. The officer in charge of the *Iron Duke* had had two-and-a-half years' sea experience as midshipman and sub-lieutenant, *plus three months* as a lieutenant. He had kept officer's watch in a squadron, in prescribed order of sailing, *once* for about an hour. It is simply absurd to suppose a young man of that experience capable of taking charge of a ship in a critical situation; and the fact of his being in a thick fog, with another ship close in front of him, and telegraphing down to the engineer to go "as fast as possible," is quite enough to show whether he was or was not.

In the Cunard, and some other mail companies, no officer has charge of a watch without he has been *master* of a *sailing ship*, and this necessitates ten years' sea experience, five of them as an officer and a master.

Mr. T. Brassey called attention to the want of sea experience in the *Vanguard* debate, with the small result of providing for the training of 300 additional; we enter 3,000 boys annually. The want of nautical knowledge in the seamen of the *Vanguard* was of a piece with the rest; one look-out man did not know the compass. Any intelligent boy in a merchant ship learns this in a few weeks. It is nothing short of miraculous that our Admiralty have not realised that pic-nicing about in ironclads, or lying at anchor in Besika Bay, is no way to learn seamanship.

By way of contrast, turn to Goodenough's journal, "Cruise of the *Pearl*." Read the account of beating up Simon's Bay in a gale, p. 171:—"I enjoyed it like a day's foxhunting." "A fellow-feeling makes us wondrous kind."

Notice how he went in and out of the coral reefs in the Pacific, never using steam except in a calm, or on an emergency, and the aid he rendered to merchant ships in distress. "We have had no steam since Suva, have run 1,500 miles, and entered five and left five harbours, three of them close and two open, and without a pound of coal." This is one of the ways in which our young seamen should learn their business. The training of our young seamen leaves much to be desired.

Captain Wilson, R.N., lately the Superintendent of Training Ships, has stated, and Mr. Shaw Lefevre has endorsed it in the House of Commons (April 10th, 1876), "that two-fifths, or 1,200, of the boys are cooped up in the harbour ships, learning little but evil." It is painful here in Liverpool to see in the ironclad guard-ship the crowds of young men about twenty years old, whose "seamanship" instruction appears to be limited to going after water to the Rock Ferry slip in a steam launch.

It is a melancholy fact that a nation that spends about eleven millions annually on its Navy, and can afford to spend £70 a-ton on building rattletraps such as the *Tourmaline*, cannot afford £14 a-ton for a few sailing vessels to salt their boys.

The Germans manage the training of their officers in a different fashion. The boys have in the first place to go to sea for six months, to find out whether they are qualified for a sea life; if so, they are then ranked as sea cadets; they are then sent a two years' voyage, in the sailing frigate *Niobe*, to China and Japan. This qualifies them for Second Lieutenants at sea; to be First Lieutenants at sea, they must have had five years' afloat. (*Times*, Oct. 18th, 1875.)

The education of our young officers appears to have become a shuttlecock between two parties. One side maintains that scientific instruction is the grand desideratum; that our

ships have become so complicated, that they have twenty or thirty engines on board, &c., &c., &c.; and that the Chinese method, or, in official language, "the higher education of naval officers," is the only course open. The other side, the old school, so ably represented by the late Admiral Rous, assert that our sea training has gone all to the devil; that the young officers know about as much of seamanship as a lady's maid who has crossed half-a-dozen times from Dover to Calais; and that on the loss of the *Captain* the officer of the watch did not know how to get his topsail-yards down. (See *Times*, Feb. 14th, 1876.) I desire to point out that a man who brought the *Pique* across the Atlantic in the state in which she was, leaky and rudderless, must have been a pretty good sailor, and his opinion deserves attention. The Admiral recommended the establishment of a flying squadron of small sailing ships, and there is no doubt he was right. The "complication" theory is always put forward as an excuse whenever ships get into any scrape, or so-called accident. The fact is—with perhaps the exception of the hydraulic turret gear—all these engines, such as steam winches, capstans, windlasses, steering-gear, &c., were in use in merchant ships long before the Navy had them, and they are worked every day and all day by their non-scientific crews, and without exciting the least enthusiasm. I doubt if the turret-gear of any ship is heavier than the hydraulic dock-gates of the Waterloo Dock, in Liverpool. The men who work these gates receive about 25s. a-week. There is a story in a late number of "Fraser's Magazine" of a naval officer of rank who "thanked God he did not know what the curve of stability meant." Without endorsing this thankfulness, I desire to point out, that if the choice is to lie between the scientific man who does not know how to handle his sails to prevent the ship capsizing, and the non-scientific man whose knowledge of curves may be of the most cursory

kind, but who knows how to handle a ship at sea, then, I think, most men will decide for the latter.

Dundonald was beyond all question one of the ablest seamen Britain ever produced, and nothing can be stronger than his condemnation of the present system of education:—"The modern practice is to place ships in commission with everything perfect to the hands of officers and crew, little being required of them beyond keeping the ship in order whilst at sea. The practice is to a certain extent praiseworthy; but it has the disadvantage of impressing officers with the belief that handicraft skill on their part is unnecessary, though in the absence of practically acquired knowledge it is impossible even to direct any operation efficiently. Without a certain amount of this skill, as forming an important part of training, no man can become an efficient naval officer." ("The Autobiography of a Seaman," 1872 edition, p. 38.) Our naval officers think themselves in no way inferior to their forefathers, and any one who will turn up the *Army and Navy Gazette*, of Feb. 19th, 1876, may see the ridicule with which Admiral Rous' opinions were received. As an entire outsider, however, I should like to ask what appearance our Navy made on the last occasion it had anything to do? I don't mean walloping some fifth-rate niggers, but the last event of importance, viz., the Russian war; their warmest admirers are forced to admit that our Navy conspicuously failed to do anything worthy of their great reputation. What middle-aged man does not remember, when Napier boasted he had brought his ships home safely from the Baltic, the retort of that veteran sea-eagle, Dundonald, "that in his time the ships were accustomed to fight as well as to be taken care of." Here is an extract from a source too valuable to be overlooked:—"The Emperor (of the French) was very anxious that a plan of campaign for the Baltic should be agreed upon. This was of less im-

portance to him, who would join his ships to ours in whatever might be done; but it was of the greatest importance to us, whose prestige as masters of the sea, he considered, had been terribly shaken by the nullity of our proceedings last year. Nobody dreaded us any more, and this was a misfortune over which he sincerely grieved." (Martin's "Life of the Prince Consort," iii. 234.) There was no doubt individual encounters of great gallantry, but the Navy on its proper element in no way affected the result; and landing the men for the naval brigade appears to me an admission of their failure in their proper sphere. Read the following criticism on naval "accidents":—"Of late we have come to expect that a paragraph of naval intelligence will contain accounts of boilers that go wrong as mysteriously as the china dusted by unimpeachable housemaids; of ships provided with the most elaborate mechanism which can supply everything but the one thing wanted, namely, presence of mind and soundness of judgment; and of officers with whom it is impossible to find a single fault, except that the ships under their command perversely get into trouble." (*Saturday Review*, Nov. 4th, 1876, p. 557.) When the Navy do a gallant thing they should be properly backed up at home; this I conceive was not done in the case of *Shah* and *Amethyst* versus *Huascar*. Admiral de Horsey did a most plucky and successful action, and if he did not make the *Huascar* strike, he made her run, and would have infallibly destroyed her with torpedoes had the *Huascar* decided to go on with the game. Our ships came off without loss of life, *because* they were handled in a masterly manner. I don't think Palmerston would have "damned with faint praise" Admiral de Horsey. On the contrary, I think he would have sent his entire approval, and recommended the admiral for K.C.B., and the captains for C.B., and, what is more, I believe Queen Victoria would have given it them.

Of what use is it spending eleven millions yearly on our Navy, if our merchantmen are to be plundered, and our officers and engineers bullied and sat upon, by the first highwayman who presents himself?

It may be here pointed out that the men who have played conspicuously active parts on this world's stage have not been theoretical or highly educated men at all. Among soldiers, Wellington and Colin Campbell were not. Among sailors, Nelson, Collingwood, and Dundonald were not; Nelson was a man of one theory only, and that was, when you see the enemy go at him at once. Collingwood was a first-rate sailor, none better. His conduct of the *Excellent*, at St. Vincent, will remain an example to our sailors as long as Britain has a plate of iron to knock into a ship. Out of fifty years' service, forty-four of them were active, and he was once twenty-two months at sea without dropping anchor. (See his Life, by William Davies, p. 9.) Among engineers, George Stephenson and James Naesmyth were not, neither was Fairbairn. These men were all brought up with hammers in their hands. Naesmyth's opinion of himself was, "I am but a poor tool in the literary line," but there is no doubt his steam-hammer "may be said to have almost revolutionized the iron manufacture." (See Pole's "Life of Sir. W. Fairbairn," p. 409.) Neither our present ships or guns could have been built without it. And so it may be said of our ablest living men, Alfred Holt, E. J. Harland, and William Pearce; they were all brought up with hammers in their hands. Another man, in quite a different walk of life, who has probably left as deep "footprints on the sands of time" as any of his generation, does not appear to have much availed himself of what some are pleased to call "higher education." I refer to Bismarck. His chief pursuits at the University of Göthingen were "hunting, riding,

swimming, gymnastics, and fencing." (See "The Two Chancellors," by Julian Klackzo, p. 14.)

The best shipmaster I ever knew was the late John Gray, of the *Great Britain*. He was the son of a small farmer in Shetland, and went to sea as an ordinary seaman for 25s. a-month. He raised himself by sheer perseverance, ability, and integrity to the top of his profession, and to the most important command in Liverpool. I had the honour to serve under him three voyages, and our friendship of fourteen years terminated only with his life. He commanded the ship through the Crimean War, the Indian Mutiny, and eighteen voyages round the world, with advantage to the country, with credit to himself, and last, though by no means least, with profit to his employers. To keep the dish upright among six hundred passengers, and to get that ship out to Melbourne in fifty-five days, requires, as the hunting man would say, "some doing." His knowledge of his profession was only equalled by his modesty. I asked him once how he had got all his knowledge, and his reply was, "I am a man of very little schooling; any knowledge I have, I have got for myself as I went along." Peace to his memory! There is no man I look forward to meeting with more pleasure in that world where "there was no more sea."

Assuming that the sea training of our youngsters is bad, the best and most economical way of reforming it would, I suggest, be as follows:—Go to the best builders of the China clippers, such as Steele, Hall, Laing, Connel, &c., and build twelve ships of the tea-clipper type of, say, 850 tons register each. The *Sir Lancelot*, built by Steele, would be a capital type of ship. These ships could be built in six months for £14 a register ton. They should be of the 100 A-1 class, or equal thereto; the 42-inch spacing of frames, and half-inch bottoms, I consider a simple abomination. If properly taken care of, they will do thirty years' work. They should each

have 300 tons of stone ballast as a minimum, and be guiltless of machinery of any kind save a condenser. The cost of twelve such ships, with full East India outfit and reasonable (£7,200) establishment charges, would be £150,000, or about the price of one corvette of the *Active* type. One *Active* more or less does not to England make the difference between a good Navy and a bad one. With these ships you could provide for the training of three hundred young officers, and three thousand six hundred young men. I would start them off on a two years' voyage round the world, and the only extra stores they would require would be three coats of composition for their bottoms, and sufficient oakum and pitch to caulk their decks once. Either zinc or tallow, or McInnes' or Ratjen's compositions, will keep clean six months. I would impress upon the men in charge of them the necessity of their doing things for themselves, and not running up bills in foreign ports, except for water and provisions.

Their bottoms should be cleaned by heaving them down. Anson and Cook could do this, and much more; we degenerates always want a dockyard running about after us! The whole of the work on the mizen-mast should be done by the young officers, reefing, furling, and bracing the crossjack yards, as I would make it a point that they should be able to do everything about a ship with their own hands, from heaving the lead to taking a lunar. Indeed, I would not object to their having a few spells of tarring down and greasing the masts, till they knew how to do it. There is only one other remark, which applies to all the Queen's ships. The men should be better fed; a pound of butter per week, and coffee for the morning watch before turning to. All respectable merchant ships give this. If the men responsible for our sailors' food had themselves to go without from half-past four one afternoon till eight the next morning, and, in addition, keep the eight hours out, there would soon be a change.

ON NATIONAL DEFENCE AND SUGGESTIONS.

CHAPTER V.

For the British, the command of the seas is not a question of party, but a question of existence. All our tea, coffee, sugar, cotton, and tobacco come from abroad, as does also half the corn. We paid, in 1877, for corn, cattle, and meat from abroad, nearly ninety-seven millions. (See *Times*, Jan. 10th, 1878.)

We have something like nine and-a-quarter millions of tons of merchant shipping, and about twenty-four thousand ships and steamers. The proportion of ships to steamers is about six to one. We have sixteen thousand vessels of one hundred tons and upwards. This includes the colonies. In case of war, what have we to protect this vast property? Thirty-nine ships, and seven building. Of the thirty-nine ships, twenty-three are built of wood; two of them have speeds of about 13 knots, and five days' coal, and eight others have about 12½ knots, and six days' coal. This exhausts the list till we come to the *Tourmaline* class; and as these ships' engines will not go in bad weather, they would afford no protection to steamers; they might protect sailing ships in calm weather. The twenty-three wooden ships would be also useless to protect steamers, for were they driven at full speed for a fortnight in moderately bad weather, they would become so leaky, as probably they would founder. Practically, the situation is this: Were war to be declared to-morrow, and

privateers to be let loose on our commerce, we have not in the Navy ten ships which could cope with the privateers on fair terms, and that only to the limited tether of their (the frigates) coal endurance. There is not in the whole list a vessel that could be depended upon to make a winter passage to New York at the rate of 12 knots, and this, not only as to a question of coal endurance, but also as to questions of structural strength and model. A writer in *Fraser's Magazine*, November, 1875, p. 681, in speaking on this matter, gives it as his opinion "that there is not a man-of-war in the English Navy that could be relied on to cross at any average rate in winter." In the face of all this, the First Lord of the Admiralty told us, not a week ago, "that the Navy never was in a better condition," and the customary shouts of applause followed in due course. Probably nothing but a disaster such as befel our neighbours will affect our composure as to the Navy; suffice it for me to put the facts before the public as clearly as I can, and to remind them, "Quem Deus vult perdere, prius dementat." Supposing only half of the sixteen thousand ships to require convoy, forty to eight thousand, or one to two hundred, does appear to be a somewhat microscopical amount of protection. In the old war, when our cruisers were undoubtedly superior to merchantmen, the proportion was ten or twelve to one hundred of convoy. In these days of steam it is not easy to see how they could well be less. The amount of damage privateers would do our commerce, I am afraid to estimate, and no one would believe me if I did. Perhaps the late author of "The Battle of Dorking" may be listened to. Colonel Chesney's essays in military biography, articles on Admirals Farragut and Porter, and the "Navy of the Union," p. 342: "But we are more concerned here to point out the urgent necessity which will arise, in case of England engaging in a war, for our commerce being more efficiently guarded

at sea than by ironclads of 5,000 tons, or first-rate wooden frigates. A class of swift corvettes, carrying two or three heavy guns, with engines so powerful as to enable them to overhaul any ordinary merchant steamers, will be absolutely indispensable if our trade is to escape ruin in any future Naval war, whilst privateering is employed against it. The *Alabama*, *Sumter*, and *Florida* . . . . at the close of 1864 (had captured) one hundred and ninety-three vessels, valued, with their cargoes, at thirteen and-a-half millions of dollars."

The wretched "gems" (*Tourmaline*, &c.) were built with the express idea of protecting commerce, and to have a speed of 13 knots. (See Brassey's "Unarmoured Ships," pp. 3–10.) The Americans make no secret that, in the event of war with us, this is the line they would adopt, and a statesman must, I think, have more than ostrich blindness to suppose the Declaration of Paris would prevent the Russians doing the same.

A master of the art of philippic, who has worked his way to Prime Minister of England, and an earldom, has left on record in a speech, "that there is nothing more fatal to the national interests than the recklessness of ignorance," and I have, therefore, got together the particulars of some ships we might have to provide against as privateers. I have taken only four important companies, simply from want of leisure to hunt up more, and that these companies publish handbooks of their shipping, which are easily checked by the register books.

For the French: The Compag. Genle. Transatlantique and the Messageries.

For the German: The North German Lloyd's and the Hamburg American Companies.*

* May, 1878. The *Cimbria* belongs to the Hamburg American Co. I have before me the times of eleven of her late passages from Havre to New York. In speed, she is about equal to the *China*.

The result of the investigations is as follows:—In the French lists there are sixty-eight steamers; of the Atlantique Co., two were built by Napier, and four more rebuilt in this country, altered to screws, and engined by Maudslay, almost the same engines as those of the White Star Company.

Of the crack boats of the Messageries, it is sufficient to say that they are quite equal to their neighbours, the P. and O. They go at a greater speed, as they are better paid. I have before me the report of the Mauritius Chamber of Commerce, as to the conduct of the mail service in 1876. The mail service of this British colony is entirely performed by the Messageries. "The Chamber is glad to testify that the service is conducted with the same regularity and punctuality as heretofore."

In 1876, in thirteen trips, there was only one breakdown, and they were six days late; they were twice late, two days and one day; and three times early, one day, one day, and two days. Inwards, they were nearly always early. In January, 1878, three days early, and again in March, 1878. The Transatlantique Co. keep tally of their own and their neighbour's performances, and this information I possess. I have no difficulty in saying that the German New York going vessels have a blue-water speed of 13 knots, and a coal endurance of thirty days. From the French lists there would be no difficulty in picking twenty-eight vessels, and from the German twenty-four vessels, with a blue-water speed of 12 to 14 knots, and a coal endurance of thirty days. The fifty-two vessels are upwards of 2,500 register tons, and 500 horse-power.

There is a feeling among naval men that ironclads might protect commerce, and Admiral Stewart, at the launch of the *Northampton*, pointed in great triumph to that ship as one calculated "to drive away the wasps."

It is not usually considered the acme of wisdom to take

a sledge hammer to break an egg, but as the Controller of the Navy was said, by the late Mr. Hunt, to be one of the most talented officers in the service, it may be well to devote a few lines to show how far the Admiral's project is likely to be realized.

The *Northampton* is a ship of 4,700 tons, builder's measurement, 280 feet by 60 feet by 26 feet draft; engines, two S., compound, 6,000 I.H.P. Paper speed, let us say, 14 knots. Coal for this at 2·5 per I.H. per hour, 161 tons a-day. Suppose she has a blue-water speed of 11¼ knots on 80 tons, she carries 1,100 tons of coal, and this gives her fourteen days' coal endurance. Suppose her cost (Parliamentary Paper, No. 383 of 1875), *plus* 10 per cent. for charges, to be £415,477.

Now for the wasp. The *Lusitania*, built by Laird for the Pacific Company in 1871, and now sold to Green & Anderson, to run to Melbourne, is 3,825 tons gross. She is 370 by 41 feet, and her draft 23 feet. Her blue-water speed is 12 knots on 48 tons. A friend of mine commanded her, and is my informant. The capacity of her hold is 137,850 cubic feet, and her coal space 48,805 cubic feet; to be well within the truth, say 1,800 tons weight of cargo, 1,200 of coal, and 500 souls on board. She has gone from Plymouth to Melbourne, *via* the Cape, in forty days, calling only at St. Vincent's. She is by no means the largest or fastest of our mail steamers, but is an example of a successful long-voyage one. The figures I have given may easily be checked by the published returns of the Pacific Company. Her cost was £91,852; or, the *Northampton* costs as much as four-and-a-half *Lusitanias*, and takes four years to build against one. The *Northampton* is new, the *Lusitania* is seven years old. It is proper here to point out that the *Northampton*, from her model, would not do much going head to sea; and the rigging of H.M. ships is so clumsy

and antiquated—great big tops and caps, no patent trusses, &c.—it would hold such a lot of wind as would probably stop her a knot an hour. To attempt to protect commerce in this way seems to me a brilliant example of "how not to do it," and how to spend four-and-sixpence instead of a shilling.

Admiral Robinson, the late Controller of the Navy, in one of the periodical glorifications of his and Mr. Reed's, C.B., pet child, the *Inconstant*, made the following statement (*Times*, Nov. 22nd, 1875): That there are certain tracks in the ocean through which all sailing ships necessarily pass, and that all we have to do is to cruise about in these; and that small ships would not engage in distant expeditions. On the most favourable estimate, the *Inconstant* carried (I use the past tense, for the weights on the boilers are reduced) 216 *hours'* coal, at ten knots. (Brassey's "Unarmoured Ships," p. 7.) By the time she had got to her station, and kept in hand coal for fighting, chasing, and coming home again, how much would she have left for cruising? for to cruise under sail when the privateers are under steam, means doing nothing.

The statement that small ships will not engage in distant expeditions is so palpably absurd, that were it not put forward by a Controller of the Navy it would not be worth refuting. The *Alabama* was 1,044 tons B.M., say a quarter the size of the *Inconstant*: she destroyed plenty of vessels in the Indian Ocean. Her great advantage, as her builder said to me, was her extreme mobility: "She was here to-day, gone to-morrow, and you never knew where she was." She was very fast under sail, and could overhaul any laden merchant-ship.

This subject of privateering is so vital to us, and so wofully neglected by the Admiralty, that I must ask the reader's patience for a few remarks of comparison between the *Russia* and the *Inconstant*. The *Russia* was launched in 1867, the *Inconstant* in 1868, and therefore the same infor-

mation was available for the Admiralty as for the Cunard Company. Observe, the *Russia* is about 1,000 tons smaller than the *Inconstant;* she went on her trial trip 15¾ knots, and if built with the same "slimness" as the *Inconstant,* and jockeyed on her trial trip in the same way, would have no doubt gone 16½ knots. The blue-water speed I take as the same, though, if it came to going into a head sea, the *Russia* would lose the *Inconstant* in a few hours, simply on a question of model, though I am as certain as I am of death that the *Inconstant* is far too "slim" to be driven into a moderate Atlantic sea. The relative coal endurance of the two vessels, crediting the *Russia* with coals instead of dead weight cargo, is 25 days to 4½ days, or say five times. The relative cost of the two vessels, £105,000 against £250,000, say two and-a-half times, and this is handicapping the *Russia* with the cost of cabin-fitting, linen, plate, crockery, &c., for 180 passengers first-class. So that, apart from all questions of structural strength, or cost of maintenance, the *Russia* is eleven times more efficient than the *Inconstant.* I am prepared to admit that the *Russia* would not carry sixteen 12-ton guns on her main deck, but *cui bono?* It is sufficient time to provide for this when the privateers carry 12-ton guns. The *Russia* would carry two 7-inch 6-ton guns, and sufficient 64-pounders, the shot and shells of which, if they hit, would settle any unarmoured ship. If we look at the relative work the two ships have performed, the contrast is still more unfavourable to the *Inconstant.* I saw the *Russia* start on April 6th, 1878, for her ninety-eighth voyage. One of the owners told me she had not had new boilers, the old ones had been repaired, and she carried the same steam, and was as fast as ever. The *Inconstant* has been to India and back, *viâ* the Cape, and one or two cruises with the Channel Fleet, or as much altogether in eleven years as the *Russia* has done in six voyages, say seven months.

The *Russia* is as fit as a fiddle, and to go for a man's life. In what state is the *Inconstant?*

It must, I think, be painfully apparent to any one who will look at Table V., that we have no ships for convoys; and this will have to be done by the mail-steamers. The only difficulty is in protecting the boilers and cylinders, which, in all the best vessels, are above the water-line. The type of engine, with the high pressure cylinder above the lower, as in Maudslay's four-cylinder and the Alfred Holt type, are particularly so.

It was found on trial at Portsmouth (*Times*, Oct. 16th, 1877), that 10 feet of coal and two ½-inch iron plates would keep out the shot of a 64 pounder at 200 yards.

In the action of the *Shah* and *Huascar*, the *Shah* was blazing away with electric broadsides, in fine weather and smooth water, for nearly three hours, and though the 7-inch and 9-inch guns were theoretically armour-piercing, omitting all mention of the concentration, the *Huascar's* armour was only pierced once at a spot where it was 8½ inches thick, and she went out of action practically uninjured.

I think it fair to assume that no privateer is likely to make a better fight, or with better guns, than the *Shah*, and to this end I would have athwart ship bulkheads of 4-inch iron and 12-inch teak kept ready to put up in all our crack mail-steamers. The armour of the "dummies" might be utilized for this purpose. If the cable-chains were, in addition, festooned over this, *à la Kearsage*, the vitals of the ship would be practically shot-proof, as long as you kept her end-on, and this the steam-power and steam-steering gear would give you a fair chance to effect. The longitudinal protection of the boilers and engines is a subject which cannot be dismissed off-hand. I regret I have no time to go into it. Every ship would require separate treatment, and it

requires a shipbuilder as well as a seaman. Viewing the large carrying power our steamers have, I see no difficulty in making them carry some armour instead of cargo. This is the question of the day. I see no hope of our Admiralty taking it up successfully, without they first give up a number of their fads, and, more than all else, their "chopping block" theory. As regards the armament, I think two heavy guns of either 7-inch or 8-inch, and four or six 64-pounders, would answer every purpose. We appear to have a good stock of these; 578 of the first, and 638 of the second. (See General Campbell's evidence at the Lynal Thomas trial, *Times*, March 2nd, 1877.) According to Admiral Robinson (*Times*, March 23rd, 1876), 276 rifled guns of all sizes were afloat in ironclads. Allowing a margin for those under repair—there are some, I believe, at the bottom of the Irish Channel—I hope we may reckon on 600 available; if so, we shall not be stuck for want of guns.

There is another pull the mail-steamers would have, from their great numbers; I mean ramming. Put four mail-steamers at equal distances apart, say four miles off an ironclad, point one for each broadside, one for the bow, and another for the stern. Then go at her full speed. When within a few hundred yards, and pretty sure of the mark, go full speed astern with the one pointing for the enemy's stem, and stand by to save life. I think you would have a very good chance, especially if it was night-time, to put three holes in her, each as big as a good-sized room. In comparison to this, the *Vanguard* got a mere scratch, but she sunk in fifty-nine minutes. No unarmoured ship would stand this, and if it did not sink such a ship as the *Inflexible*, they would have plenty to do to get her into port, and it would take six months to repair her. Suppose we lost a few of our own ships in doing it, the game would still be well worth the candle, as we have so many more steamers than any one else.

It is just a game of drafts, with three kings against one.*

In striking a double-screw ship about the stern, you have a better chance of disabling her than a single-screw, because the screws are more exposed.

A few words may here be said about the case of the Royal Naval Engineers. Mr. Reed, C.B., brought forward their case, saying they were ill-paid and badly treated. It appears to me, as an attentive spectator of naval matters, that the way in which, in many cases, their duty is performed, leaves much to be desired. It is not a little significant, that on the explosion on board the *Thunderer*, where there must have been present some two dozen engineers, it was the business of none to keep a look-out on the steam-gauge, and to move the safety-valve when the steam was getting up. In our service, the engineers mess by themselves; I have known attempts made to amalgamate their mess with the officers', but it has always failed. As regards the relative pay of the two services, I believe it may be fairly stated as follows. The pay of the chief engineer of a mail-steamer is £18 to £20 a-month; everything found but their clothes. The pay of a chief engineer, R.N., of twelve years' service, is £292 a-year, charge-pay £36 10s., total £328 10s. a-year. They have to find their own bedding and most of their food, say £50 a-year to the debit. When out of a ship, their half-pay is £146 a-year. Their widows and children are entitled to a pension of £100 a-year, and if killed in action or drowned on duty, the half-pay of their rank, with possible additions in the shape of compassionate allowance. That these latter are not mere fictions, may be seen by referring to the Navy Estimates, 1877–78,

* June, 1878. The sinking of the *Grosser Kurfürst* shows, I think, that this paragraph is well within the truth. Moral for us:—"Do not keep ironclads at sea so close together."

pp. 138, 206, whence it appears there are 114 widows on the pension list, and 122 officers receiving half and retired pay, to the tune of £33,377 for the year. No such thing as half-pay or pensions are current in our service. I quite fail to see the R.N. engineers are badly paid. I think the Admiralty would have done far better, and have saved the public money, in taking young men who have served their time in good shops where marines are made, than in establishing the *Marlborough*. If the men had had some sea experience in a merchant-steamer, so much the better.

For reasons already given, I do not here enter into the ironclad question, but some few words must be said on the *Inflexible* controversy. My clear opinion on this matter is, that the *Inflexible* should be completed and sent to sea as soon as possible, and without paying any attention to Mr. Reed. The controversy has been fully, and, let me say, most impartially put before the country by the *Times* newspaper and, beyond calling attention that Mr. Reed refused to go before the Committee, and let his statements stand the fire of cross-examination, and that in this, as in the matter of the half-inch bottom of the *Vanguard*, he criticised with his usual impatience anybody who ventured to differ from him. It is sufficient for me to refer to the letters of Mr. Brassey, Admirals Hamilton and Charles Hope, and Mr. Reed, in the papers of 8th and 12th Jan., 1878. There are, no doubt, plenty of officers and men who will be delighted to take the *Inflexible* into action whenever the occasion arises. The dictum of Lord Dufferin's Committee is just as true now in 1878—or truer, for that matter—as it was in 1871. "A perfect ship of war is a desideratum which has never been attained, and is now further than ever removed from our reach." Not the least important part of the sailors' art is doing the best with the tools he has. I have no doubt the *Inflexible* will take her own part, and these, after all, are the

main objects of the controversy. Admiral Charles Hope very properly points out how unfairly Mr. Reed quotes the report of the Commission, to support his own views. The position of Mr. Reed, in his present altered circumstances, resembles very much that of Lord Brougham, when Lord Melbourne refused to make him Chancellor again; there is nothing he craves for so much as notoriety, and keeping his name before the public, and it is probable that the controversy of the engineers and *Inflexible* may in this respect have served the purpose.

I would finish the ironclads building, but would build no more, because, out of the five naval powers of Europe there is no combination probable that could or would bring their ships out into the open and try to tackle us.

In blockading an enemy's ports, our ironclads would run great risk from torpedo boats of the *Lightning* type, without we have a sufficient number of *Lightnings* to act as patrols. Happily, we can have a hundred *Lightnings* for the cost of one *Inflexible*, or eighty for the *Northampton*, and in much less time. The cost of the *Lightning*, according to Mr. Donaldson, was £5,250.

My parting advice to the Admiralty is, to make better provision for training their young officers and men. I believe the naval history of England, from the time of the Spanish Armada down to the *Shah* and *Huascar*, will show that success follows the best men, and not the best ships. To give up their fads in ship-building, such as building of wood, or plastering iron ships over with copper and zinc, and the 42-inch and 48-inch frame spaces and half-inch bottoms, and engines that will not go except in fine weather. The weakest part of our Navy is, that we have next to no ships to protect our commerce.

The first and most obvious result in spending two shillings instead of one, is that you decrease your ships one-half.

Let our unarmoured ships approximate in model, structural strength, coal power, endurance, and last though not least, in cost, to our mail-steamers. I have laid it down as axiomatic, that there are no real improvements in the Navy that have not first been adopted in our service. I beseech the Admiralty to look around and see whether there be not some truth in the converse of this proposition. How many of their fads have we adopted? and if there was anything in them, is it not at least probable that men who have their living to get with ships, and whose wits are sharpened by competition with others, would have taken them up? To keep the Navy up to its proper state, or one worthy its past traditions, is no easy task. Assuredly it does not make the task easier to be perpetually swaggering about it. There was no man who *did* more service to his country than the Duke of Wellington; there never was one with less swagger about him. On a late memorable occasion the Marshal replied to the Emperor, "Sire, the Army is complete down to the last button on its gaiters;" and as a counterpart to this, how often do we hear that the "British Navy is the finest, and our naval administration the model, of the world!" Is the average opinion of the Navy to-day any lower than that our neighbours had of their Army in July, 1870? Not one iota. We live in troublous times, and none can tell what a day may bring forth; we do know the calamity that befel our neighbours, God grant that when the pinch comes our own fate be not equally disastrous!

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